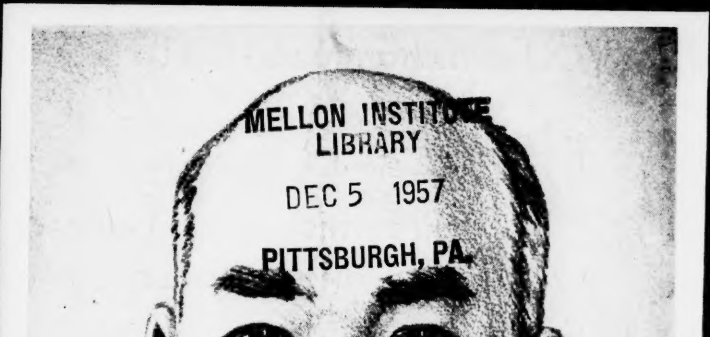
Metals Review



November 1957

Tokushichi Mishima
Sauveur Achievement Award
(See Article, p. 4)

Metals Review
The News Digest Magazine

November 1957
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Important Lectures

Departments

ASM Review of Metal Literature

Japanese Metallurgist Receive Sauveur Achievement Award

THE PERFECTION OF STRONG PERMANENT MAGNETS, magnets which may be prescribed for strength and tailored for shape and size, is due to the insight, the patience and the enterprise of Tokushichi Mishima, Japan's most eminent metallurgist, who shared in the Second World Metallurgical Congress, as he did in the First, and who was in Chicago this month to receive the Albert Sauveur Achievement Award of the American Society for Metals for his "pioneering metallurgical achievements which have stimulated organized work along similar lines to such an extent that a marked basic advance has been made in metallurgical knowledge".

Prof. Mishima's pioneering accomplishments were with the ternary alloys of iron, nickel and aluminum lying in the range 18 to 30% nickel, 8 to 15% aluminum, and the remainder iron. He fixed on this range after patiently testing 120 permutations of alloy percentages. He noted, interpreted and understood why a magnetized high-nickel steel became nonmagnetic after heating to high temperature and slow cooling. This irreversibility lay with its A_3 phase transformation. He judged that the addition of aluminum would eliminate that magnetic block, and it did! By determining suitable quenching and tempering rates for optimum compositions he achieved residual magnetisms ranging to the high values of 5500 to 11,000 oersted.

This was in March 1931, the month after his 38th birthday. He was a doctor of engineering and assistant professor of Tokyo Imperial University's faculty of engineering, in charge of metallography and physical metallurgy, the sciences for which A.S.M.'s Professor Sauveur had pioneered. He was also married into a family which had adopted him in the gentle pattern we remember from Greek and Roman history—for example, Julius Caesar's adopting and naming as heir the boy who became Emperor Augustus. Tokushichi Mishima, whose given name means "Seven Virtues", named his new magnetic alloy series simply with the initials MK of his paternal and adoptive families.

Also he took out the first of his 54 patents throughout the world, read the first of 22 papers at the convention of the Iron and Steel Institute of Japan, and perfected the magnetic quaternary alloy by adding cobalt to the original ternary. All this within a single year! Between 1933 and 1945 he published nothing because the Japanese army "classified" all his work, but since then he has resumed publishing steadily, his latest work appearing in 1955 under the title of "Process of Sintering M-K3 Magnet (Fe-Al-Ni-Co-Cu)".

The Japanese Government has paid tribute to Prof. Mishima's metallurgical work with increasingly high honors, topped with its highest, the Cultural Medal and Decoration, in 1950. His colleagues in Japanese science have also honored him by electing him president—Iron and Steel Institute (1947), the Institute of Metals (1949), and the Casting Institute (1954). He is a leading member, councilor or chairman of many of his Government's advisory groups, including Aeronautical Technology, Atomic Energy and Introduction of Foreign Technologies.

M.E.I. Rings (School) Bell in Los Angeles

Enthusiasm is the word for the study courses of A.S.M.'s Metals Engineering Institute, now under way in Los Angeles.

Under the energetic guidance of E. T. Bergquist, chief metallurgist, Western Gear Corp., and chairman, educational committee, Los Angeles Chapter, 95 students have been enrolled for the "Elements of Metallurgy" course. Meeting on Monday evening each week, since Sept. 30, under the instruction of Charles H. Dickson, chief engineer, California Alloy Products Co., the course has been well received. Additional students are slated for enrollment as a result of the enthusiastic comments of the present enrollees.

"The course has been enthusiastically received and has been well attended", says Mr. Bergquist. "It was interesting to note that the session this week was attended by 92 out of a possible 95 enrolled. This is very good considering the extent of the Asian flu in this area".

Mr. Bergquist added that a number of inquiries have developed with regard to presentation of the M.E.I. course on "Heat Treatment of Steel".

Enrollment in both in-plant training courses and home study courses of M.E.I. continues to climb, with the four courses listed below ready for student use and other courses listed nearing the Jan. 1 completion date.

A.S.M. Appoints Du Mond

TED DU MOND has been appointed to the A.S.M. staff to serve as editor-in-chief of the educational courses prepared by the Metals Engineering Institute. In addition, Mr. Du Mond will be secretary of the A.S.M. Special Engineering Program Committee. In the latter capacity he will be responsible for all engineering and production sessions presented before re-

gional and national meetings of the American Society for Metals, with the exception of those papers accepted by the Transactions Committee for the technical sessions of the annual A.S.M. Convention.

A mechanical engineer by training, Mr. Du Mond has devoted most of his career to technical writing and editing, specializing in engineering materials. Prior to joining the A.S.M. staff he was editor-in-chief of *Materials & Methods*.

Mr. Du Mond has been active in many technical societies including A.S.M., A.S.T.M., A.S.M.E and S.A.E. He has appeared as guest speaker at many local A.S.M. chapters and is the author of several books.

Men of Metal

Byron B. Clow has been appointed assistant product manager, forgings, for Kaiser Aluminum & Chemical Sales, Inc., to assist in the company's nationwide sales program for aluminum forgings.

Charles W. Ostrander has been appointed technical director of Allied Research Products, Inc., Baltimore, and will be responsible for coordinating research, development, technical service and manufacturing.

Abrasives Division, Elgin National Watch Co., has announced the appointment of Donald W. MacLeod as sales supervisor in charge of Elgiloy, multi-use industrial spring alloy, to supervise field and factory sales and direct in-plant fabrication.

George A. Pyle is now assistant manager, stainless steel products sales of American Steel & Wire Division. His office will be at the company's Cleveland headquarters.

Daniel F. Rahill, Jr., formerly with Ford Motor, has been appointed to service the New York area for Jessop Steel Co. He will live in Buffalo, N. Y.

R. W. Roth leaves Oakland, Calif., headquarters to take the position of assistant manager to the business analysis and market planning department of Kaiser Aluminum & Chemical Sales, Inc., at the general sales offices in Chicago.

Rice Sales Co., O. G. Rice owner, has been appointed Northwest sales representative for Steel City Testing Machines, Inc. The territory covers Washington and Oregon.

Harold A. Tucker is leaving his post in the steel strapping division to become manager of marketing research for the Brainard Steel Division of Sharon Steel Corp. He has experience and specialized training in both steel strapping and marketing research.

Jones & Laughlin Steel Corp. has opened a sales office in Youngstown, Ohio, with Ronald E. Stillman as resident manager and William M. Stout, Jr., his associate. Both were salesmen in the Pittsburgh office.

J. D. Isaaks of Houston, Tex., has been appointed representative for Gas Atmospheres, Inc., manufacturers of nitrogen and inert gas generating and drying systems.

Harold E. Stahl is now sales manager of the Rochester Products Division of General Motors Corp. Kenneth F. Lingg was promoted to the newly created position of assistant sales manager of the division.

Speaks on Metallurgical Progress

Allen G. Gray, Technical Editor, Steel Magazine, Discussed "Metallurgical Progress" at a Meeting Held in St. Louis. Shown are, from left: Richard D. Bardes, chairman; Dr. Gray; and George Fisher, national trustee

Speaker: Allen G. Gray

Steel Magazine

Allen G. Gray, technical editor of *Steel* magazine, spoke at a meeting of the **St. Louis Chapter** on "Metallurgical Progress". The developments of the last few years on new metals such as titanium, zirconium, hafnium and beryllium and their alloys, is being paralleled by improvements in the old metals.

Two areas of progress were emphasized by Dr. Gray, the so-called "hot area", concerned with high-speed plane and missile flight, and atomic metallurgy, concerned with many new metals and their properties. In the high-temperature field, the well-known hot work die steels, based on 5% chromium, are showing considerable progress in utility as a structural material in the plane of the future. With room temperature strengths of 260,000-300,000 psi., these steels, which are air hardenable, possess high strength at 1000° F. Aluminum alloys based on powder have been developed for moderate temperature application, as have the magnesium alloys containing thorium. New age hardenable titanium alloys are expanding the horizon of this new metal, but like developments in the stainless field are keeping this metal in the running. It appears that any real increase in properties in the so-called "hot area" in the future will require alloys of a new base material. Dr. Gray predicted this would be molybdenum. Though catastrophic oxidation at elevated temperatures is a real problem, it will be overcome.

In the atomic metallurgy field, we have many new metals and combinations being developed. Of extreme interest is zirconium, because of its nuclear and corrosion properties. Here is a metal that also has good commercial possibilities. Beryllium has a good future in the atomic age and its possibilities can only be guessed at. Boron additions to stainless have extended the usefulness of this old material in the atomic age. Add to these developments in old and new metals the new advances in processing, such as vacuum degassing up to 250 tons of steel, honeycomb stainless sandwich construction and joining by high-temperature adhesives and it is apparent that progress has been extensive in the last ten years.

Dr. Gray closed his discussion with the observation that though others may have the superiority of numbers, of raw materials, or of choice of hour of aggression, it is in technological superiority that the members of the A.S.M. must lead the way.—**Reported by G. Ansel for St. Louis Chapter.**

Crucible Steel Co. of America has announced the appointment of John W. Slattery, of their Chicago sales branch, as general supervisor, stainless steel field sales, a newly created position, with offices in Pittsburgh.

C. E. Ford has been named to the newly created position of new products marketing manager by National Carbon Co. He will be responsible for developing industrial markets for new products and anticipating demands created by new technology.

As a result of internal reorganization, the Eclipse Fuel Engineering Co. has appointed Arthur D. Wilcox as vice-president and manager of the Industrial Combustion Division, and Richard E. Hayden, as manager of the Industrial Furnace Division, to be completely responsible for the development and promotion of these departments. Headquarters will continue at the company's main office in Rockford.

Speaks on AISI-200 Series Steels

Richard E. Paret (Left), American Iron and Steel Institute, Is Shown Discussing His Talk on "Chromium-Manganese Stainless Steels of the AISI-200 Series" With J. J. Hauptly, Immediate Past Chairman of the New Jersey Chapter

Speaker: Richard E. Paret
American Iron and Steel Institute

Members of the **New Jersey Chapter** heard Richard E. Paret, American Iron and Steel Institute, talk on "Chromium-Manganese Stainless Steels of the AISI-200 Series".

Mr. Paret's initial comments indicated that although new sources of nickel, such as Nicaro and Falkengridge have been found, nickel is still in short supply. Since increased requirements for nickel and nickel-bearing metals are constantly being made by industries such as aircraft and building, there is a possibility that nickel may not be available for all applications in the future. This is a matter of concern not only to the stainless steel industry but to present users of 18-8 series stainless.

The study of lower nickel and nickel-free alternates, such as the 200 series and 430 stainless steels, has been in progress for some time. General production and distribution has been sufficient within recent years to warrant American Iron and Steel Institute recognition. Industry, in general, has not accepted these alternates without resistance despite the good service they have shown. Mr. Paret strongly stressed the importance of attitudes, traditions and mental blocks which enter into attempted general changes in material specifications. He gave many examples in which these materials have been successfully substituted and indicated that many more such substitutions will be made in the future when industry is less resistant to these changes.

Mr. Paret compared the properties of the 200 series and 430 stainless steels with those of the 300 series stainless, namely 301 and 302. While discussing the problem of corrosion he pointed out that the 200 series and 430 stainless steels can be used for a multitude of general applications but not for chemical applications unless specially tested.

Mechanical properties of both the 300 and 200 series are relatively similar. In general, the 200 series requires more power for fabrication, has more spring-back because of high-yield tensile ratio and a higher work hardening rate than the 300 series. The alternate materials have been deep-drawn successfully with only slight changes in blank size and power. Type 430 has been found the best alternate for spinning applications. At elevated temperatures, types 201 and 202 are found to have greater strength than the 300 series. The 200 series, however, has a slightly higher scaling rate which encourages the use of lower annealing temperatures. Annealing of the 200 series is usually conducted at a temperature approximately 100° F. lower than for the 300 series. Type 430 stainless is most often low annealed at 1400 to 1500° F. The welding techniques applied to the 300 series materials are generally employed in the 200 series welding. Increased power input and the addition of titanium to type 430 are used to control grain growth.—**Reported by Alfred J. Spitzner for New Jersey.**

—Metals for a Finer Tomorrow—

Dayton Members Tour Monarch Machine Tool

The 31st year of the **Dayton Chapter** started off with a visit to the Monarch Machine Tool Co., Sidney, Ohio. Wives of the members accompanied them on their tour.

Features of the tour were examples of ceramic-tip machining and a 60-hp. lathe turning chips that looked like heavy duty springs.

Refreshments were served in the company cafeteria at the conclusion of the tour.—**Reported by Joseph Warga for Dayton.**

New Films

A.S.M. Metals Information Center of Tomorrow

"The A.S.M. Metals Information Center of Tomorrow", a 16-mm. color, sound film had its first public showing at the National Metal Congress and Exposition and Second World Metallurgical Congress in Chicago during the week of Nov. 4.

The movie gives the background and present status of the pilot plant experiment on mechanized literature searching being carried out at the Center for Documentation and Communication Research of Western Reserve University under contract with the American Society for Metals. It shows how conventional bibliographic tools (indexes, card catalogues, abstract volumes) have become inadequate to cope with the rapidly expanding volume of technical and scientific literature.

A case history shows how a specific problem involving research, practical metallurgy, and management decisions could be solved by a metals information center using electronic machines of the type developed experimentally at Western Reserve University. Sequences illustrate how information must be processed and encoded (translated into machine language) for feeding into the system. The punched paper tape carries the encoded information through the machine, and answers to questions are typed out by an automatic typewriter.

Robert E. Booth, Allen Kent, and J. W. Perry of the Western Reserve University Documentation Center wrote the script for the movie. The film was produced in the studios of WQED-TV, Pittsburgh, under the direction of Ted Neilson.

Copies of the film are available for showing before A.S.M. Chapters, educational institutions and other interested groups on request to American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Automation in the Metallurgical Laboratory

A demonstration, in full color and sound, of the latest techniques of metallographic sample preparation has been produced by Buehler, Ltd., 2120 Greenwood St., Evanston, Ill. The film, which runs approximately 30 min., is available at no charge to professional groups by writing directly to Buehler.

A.S.M. prepares and distributes, on request, preprints of the technical and scientific articles presented at the annual convention.

Meet Your Chapter Chairman

NEW YORK

WILLIAM J. KENNELLY, JR., district manager, Latrobe Steel Co., was born in New York City and is a graduate of Massachusetts Institute of Technology, with B. S. degree in metallurgy. He was foundry metallurgist with the Simmons Saw and Steel Co. before taking his present position.

Mr. Kennelly has been on the A. S. M. executive committee for four years and has served on various other committees.

Mr. Kennelly's fellow members consider him an efficient and enthusiastic leader and are looking forward to an interesting and enlightening year with Bill at the helm of their chapter.

Son William III is 9 and daughter Janet is 6 years of age. While in college he played lacrosse but now relaxes with golf and fishing. During World War II he served in the Army Air Force.

KANSAS CITY

DAVID C. GOLDBERG, manager of metallurgy for the Aviation Gas Turbine Division, Westinghouse Electric Corp., was born in Dallas, Tex. He is a graduate of Antioch College and has attended the graduate schools of metallurgy at Ohio State and Stevens Institute.

Prior to joining Westinghouse in 1951 Mr. Goldberg had worked with several companies, including Battelle Memorial Institute, in various aspects of development and production metallurgy.

Mr. Goldberg has long been an active member of A.S.M., having been program chairman for the York Chapter and one of the organizers of the Junior Group of the Philadelphia Chapter. He has written numerous technical papers and been the guest speaker before several of the A.S.M. Chapters. He also contributed to the chapter on titanium in the 1954 Metals Handbook Supplement. He is also a member of several technical societies.

His personal interests include the Boy Scouts of America, golf and fishing. His wife is very active in community affairs and they are very proud of their three children, ages 12, 9 and 7.

ONTARIO

RICHARD SMALLMAN-TEW comes from England. He graduated with honors, from the Royal School of Mines, London University, with degrees A.R.S.M. and B.Sc., participating in rowing and rugger while there. He worked in welding research and development, and aircraft metallurgy in England until 1946, when he came to Canada. He is now chief metallurgist at Avro Aircraft Ltd.

While still in England Richard served as pilot in the Auxiliary Air Force and lieutenant in the Home Guard. He is a member of several technical societies and has been a member of the Ontario Chapter Council for a number of years. He was an American conferee to the First World Metallurgical Congress.

He has a son and two daughters, and takes great pleasure in sailing his small schooner.

UTAH

E. LEWIS ALLEN, chief engineer, Pacific States Cast Iron Pipe Co., has been with this company for 23 years. He received his B.S. in mechanical engineering from the University of Utah and took postgraduate work at the University of Pittsburgh.

Mr. Allen is an active member in his church, deeply interested in youth movement and welfare work. He has been regional young mens organization superintendent, and at present is working with the welfare movement of his church in both local ward and parish work. He and his wife Ellen, who comes from Connecticut, have two daughters and one son.

INDIANAPOLIS

GEORGE J. SHUBAT, chief metallurgist, Diamond Chain Co., worked as a lumber-jack and iron miner before entering Michigan College of Mining and Technology where he graduated, with honors, with a B.S. in metallurgical engineering. He is a member of Tau Beta Pi and National Honorary Engineering Society. Flying has been his greatest outside interest since school days when he obtained a private license—he now has a commercial pilot's license.

Mr. Shubat is a member of several technical societies, is on the advisory council S.E.S.A. and the advisory committee on industrial practices A.S.M.

Most of Mr. Shubat's military service was in the Southwest Pacific as a lieutenant colonel, Battalion of Construction Engineers. His family consists of four childern, Suzanne 11, Georgia 8, Mary 4, and Tommy, 2 years of age.

DAYTON

WILLIAM T. BRYAN, manager, alloy casting sales and technical assistant to vice-president of manufacturing, Duriron Co., was born in West Virginia. He has a B.S. degree in metallurgical engineering from the University of Kentucky and an M.S. degree from the University of Michigan. For several years he was research metallurgist with E. I. du Pont de Nemours & Co., Wilmington, until joining Duriron Co. as research metallurgist, moving on to foundry metallurgist and assistant foundry manager before assuming his present position.

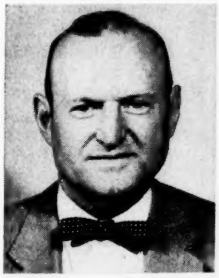
Bill has been on the executive committee of his chapter for six years, including two years as secretary. He plays golf for relaxation and claims that photography is his chief sparetime interest.

Correction

In the list of Chapter Officers printed in the August issue of *Metals Review,* W. R. Edgerton, William L. Barrett Co., was listed as vice-chairman of the Hartford Chapter. The vice-chairman should actually have been listed as W. R. Edgerton, Whitney Chain Co., Hartford 2, Conn.

R. Smallman-Tew

W. T. Bryan



D. C. Goldberg

G. J. Shubat

W. J. Kennelly, Jr.

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Combine Operations—Development of a process which performs simultaneous brazing and heat treating of precipitation hardening stainless steels was announced by Metallurgical Consultants, Inc. Brazing and solution treatment are accomplished together at 1925° F. It not only cuts furnace operations in half but produces quality parts with superior surface finish.

Expand Facilities — Expansion of present research facilities into a $500,000 metallurgical laboratory at Stanford Research Institute has been announced. The facility is the largest laboratory west of the Mississippi River equipped to undertake all phases of metallurgical research. Installation will be completed by January 1958.

World Congress—A program for the World Congress of Iron Merchants, to be held in Brussels, Belgium, June 11 to 14, 1958, during the 1958 Brussels Universal and International Exhibition, can be obtained from Communications Counselors, Inc., 345 Madison Ave., New York 17, N. Y.

Electronic Probe—Republic Aviation Corp. has installed electronic equipment that "looks through" steel, aluminum and titanium for internal flaws. Electronic principles similar to the sonar detection system for locating enemy submarines are employed.

Remote Control—A new welding unit for sealing highly radioactive materials in stainless steel capsules was recently placed in operation at Oak Ridge National Laboratory. The equipment consists of two portable units: a power supply unit and a remotely operated assembly. Sealing radioactive sources by remote welding is considered to be an important development in the radioisotope program.

New Labs—Standard Pressed Steel Co. will open screw-thread measuring laboratories to help industry with fastener fit and gaging problems early in 1958 at its plants in Jenkintown, Pa., Cleveland and Los Angeles. Each facility will make available advanced techniques and equipment for screw-thread gaging and size control and serve as a clearing house for information on threaded fasteners.

Vacuum Furnace—At the Minerva, Ohio, works of Kolcast Industries, Inc., the world's largest induction vacuum melting furnace, now in final stages of installation, will be used to manufacture an unlimited variety of castings in sizes up to 45 in. by the Kolcast process for jet engine, electronic, guided missile, atomic energy and precision parts industries.

Heat Problems Solved—Servotherm, the infrared pyrometer manufactured by Servo Corp. of America, makes possible the heating of titanium electrically to forming temperature in a matter of seconds. The need for large furnaces and difficulties of temperature monitoring and control are eliminated.

Tube Welding—Republic Steel's Steel and Tube Division has adapted ultra-high frequency resistance welding for high quality steel tubing. The method is basically the same as the Johnston process, but operates at higher frequencies, uses stationary welding shoes and reduces internal splatter, giving a more uniform weld.

Aluminum Castings—Arwood Precision Casting Co. has developed aluminum investment castings with guaranteed strength and ductility. The new technique makes it possible to use aluminum castings for parts which could previously be formed only by forging or machining. It can be used in the aircraft industry for structural load carrying parts subject to shock and impact without any change in specifications.

Hot Sinter Screen—Allis-Chalmers Manufacturing Co. has announced the development of a screen capable of handling 132 tons per hour of hot sinter at an approximate temperature of 1400° F., with hot spots to 2400° F.; previous maximum was 600° F.

Quality Castings—Large commercial castings are being produced at U. S. Steel's Duquesne Works by a vacuum casting method which extracts harmful gases from the molten metal prior to the formation of the ingot. The process, which services the needs of electric power equipment builders, can be used for other high-grade steel products where trapped gases are detrimental, such as large bearings for the shipbuilding industry and various high-speed airplane parts.

Copper Plate—Metal & Thermit Corp. has introduced a bright cyanide copper plating process, using a combination of additives which reduce plating costs and simplify control. As a result of the long life and stability of the addition agents, cost of the operation is favorable. Uniform brightness, from mirror-bright to any lesser degree, may be obtained, and the process is applicable to automatic, still and barrel plating.

Thickness-Density Gage—The thickness and density of continuously produced materials can now be measured by the Gammascan, an instrument developed by the Nuclear Systems Division of Budd Co. It provides a continuous written record as well as a meter indication, is extremely sensitive and stable, and has been engineered to operate under typical industrial conditions.

Research Associateships — The National Research Council of the National Academy of Sciences has announced that programs of Post-Doctoral Resident Research Associateships will be offered in 1958-59 by Argonne National Laboratory, National Bureau of Standards, Naval Research Laboratory, and Oak Ridge National Laboratory. Write to the Academy, Washington 25, D. C., for further information.

Microanalyzer—Battelle Memorial Institute has placed in service a microanalyzer which will be particularly valuable for exacting analysis of metals, ceramics and chemicals.

25th Anniversary—The silver anniversary of the Metals Research Laboratory of Carnegie Institute of Technology was celebrated with a full-day reunion of some 300 engineering graduates, former faculty members and friends from industry. The guests attended a reunion banquet after a tour of the facilities and a technical program on Oct. 24.

Joins Metals—Development of a joining material by Intertectics, Inc., makes commercially feasible the chemical joining of copper and aluminum, with the resulting joint stronger than either of the metals involved. The joint represents a totally new concept in the union of metals and, in some types of joints, it is estimated that industry may reduce joining costs from 50 to 300%.

Explains Transformation Kinetics

J. C. Fisher, Manager, Physical Metallurgy Section, General Electric Research Laboratory, Spoke on "Transformation Kinetics" at a Meeting of Oak Ridge Chapter. He is shown (left) with Roger Waugh, technical chairman

Speaker: J. C. Fisher

General Electric Research Laboratory

J. C. Fisher, manager, physical metallurgy section, General Electric Research Laboratory, spoke on "Transformation Kinetics" at the first meeting this season of the **Oak Ridge Chapter.**

Dr. Fisher discussed the factors that influence nucleation and growth. These factors were then applied to the transformations which occur in steel.

The transformation of austenite to ferrite (assuming very low carbon and overlooking the carbide phase) was reviewed in relation to four major facts:

1. Carbon and nitrogen strongly stabilize austenite; other elements such as manganese and nickel only slightly.
2. Carbon and nitrogen, being interstitials, diffuse rapidly; manganese and nickel rapidly.
3. The driving force for transformation is small at high temperatures.
4. Most nuclei are already present (grain boundary corners, etc.)

A very interesting example of martensite nucleation and growth was then given. Carbon-poor regions in the parent austenite act as alpha embryos below the alpha-gamma transformation temperature. When a "critical" temperature, the M_s, is reached, these embryos become nuclei for the diffusionless martensite transformation. It was pointed out, however, that elastic strain energy is very important in the martensite transformation and should never be overlooked.

Dr. Fisher then explained the bainite transformation in the light of the same type of nuclei. In this case the alpha iron regions do not reach the critical temperature for spontaneous growth, but grow by a diffusion controlled process which results in alpha iron regions surrounded by areas rich in carbon.—**Reported by P. L. Rittenhouse for Oak Ridge Chapter.**

Inaugurates New Program

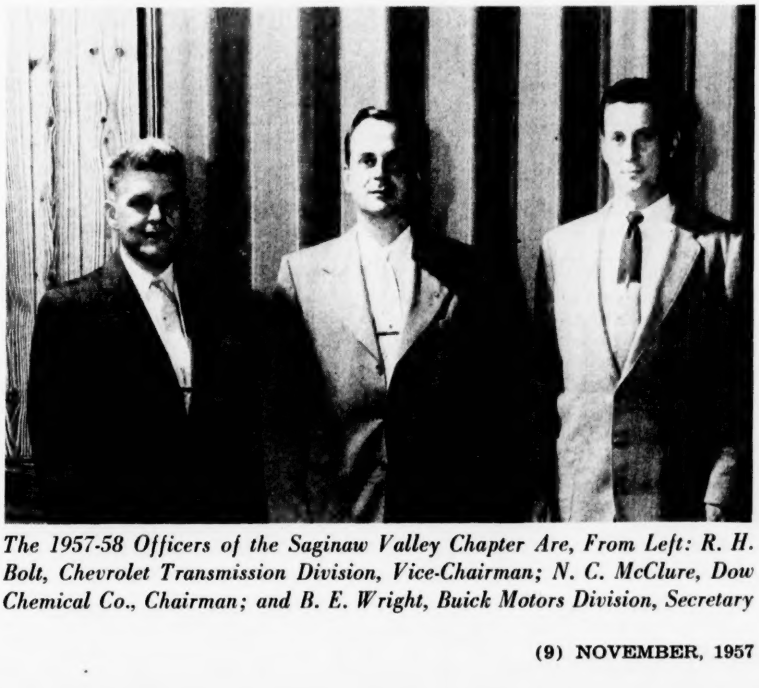
The vital role of metals in the economy of America is dramatized in the advertising program inaugurated by the American Society for Metals.

"We have a deep and abiding faith in the ever-growing importance of metals", said W. H. Eisenman, national secretary. "Over the past 40 years, the Society has backed this faith, this belief in metals, with the expenditure of millions of dollars for the collection, creation and publication of a tremendous flow of engineering information to provide a greater appreciation of what metals can do, and how they can do it.

"These efforts in behalf of metals include engineering magazines, congresses and expositions, local, regional and national technical meetings, home study courses, metallurgical seminars, handbooks, government manuals, and text and reference books. Moreover, in this era of engineering manpower shortages, the Society has conducted a continuous campaign to encourage engineering as a career, with activities channeled through A.S.M. headquarters in cooperation with 104 local chapters and directed at high school students".

The new advertising program, featuring the importance of an engineering knowledge of metals, will appear in advertising and engineering journals and has been reprinted in an attractive 11" x 14" colorful brochure, available upon request from the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

SAGINAW OFFICERS FOR 1957-58



The 1957-58 Officers of the Saginaw Valley Chapter Are, From Left: R. H. Bolt, Chevrolet Transmission Division, Vice-Chairman; N. C. McClure, Dow Chemical Co., Chairman; and B. E. Wright, Buick Motors Division, Secretary

Tells the Story of Measurements

C. G. Schelly, Managing Director of the Wilkie Foundation, Points Out to Members of the Rockford Chapter an Interesting Example of How Standards Can Improve Production During His Talk on "The Story of Measurement"

Speaker: C. G. Schelly
Wilkie Foundation

The **Rockford Chapter's** opening meeting for the season was held jointly with the Rockford Engineering Society to hear a program on "The Story of Measurement", a historical outline discussed by C. G. Schelly, managing director of the Wilkie Foundation and presented by the DoAll Co.

Colorful panel displays illustrated how the first linear standard originated and completed the history down to the evolution of interferometry. With the aid of colored slides Mr. Schelly described early machine tools for metal working and the early Egyptian, Greek and Roman instruments for measurements. He then discussed modern gaging instruments, pointing out that proper handling and the use of the modern gage blocks assure accurate results.

Fundamentally, gage blocks are simple-to-use measuring tools having two working surfaces of rectangular or square form spaced apart within tolerance limits specified by the Bureau of Standards. Units of measure are defined by the distance these surfaces are spaced apart and measurement is transferred with ease by reference to these two surfaces. Consequently, much more accurate results are obtainable, and in smaller increments, than is possible by the scribed-line principle. Gage blocks are produced in series and the nominal size of each block is plainly marked on the surface. Because of this series system, over 200,000 units of measure can be assembled from a single set of 83 blocks. Such a set is extremely versatile as measurements as small as 0.050 in. can be made and dimensions from 0.00002 in. to over 25 in. can be made in increments of 0.0000025 in.

Mr. Schelly explained that the Supreme Court of precision measurement in this country is the National Bureau of Standards. The Bureau has sets of gage blocks calibrated in terms of light wave lengths which serve as master reference standards when calibrating the accuracy of blocks used as master by gage block manufacturers and some inspection departments of industry. —**Reported by G. W. Sandstrom for Rockford.**

—ASM Leads the Way
Be Ahead With ASM—

IMPORTANT MEETINGS *for December*

Dec. 1-6—American Society of Mechanical Engineers. Annual Meeting, Hotel Statler, New York. (C. E. Davies, Secretary A.S.M.E., 29 W. 39th St., New York 18.)

Dec. 4-5—American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc.—Metallurgical Society. Electric Furnace Steel Committee of the Iron and Steel Division, Annual Conference, Penn-Sheraton Hotel, Pittsburgh. (Ernest Kirkendall, Secretary, A.I.M.E., 29 W. 39th St., New York 18.)

Dec. 5-7—National Association of Manufacturers. Congress of American Industry. Waldorf-Astoria Hotel, New York. (K. R. Miller, Managing Director, N.A.M., 14 W. 49th St., New York 20.)

Dec. 11-12—Illinois Institute of Technology. Construction Industry Meeting, Congress Hotel, Chicago. (I.I.T., 35 W. 33rd St., Technology Center, Chicago 16.)

OBITUARIES

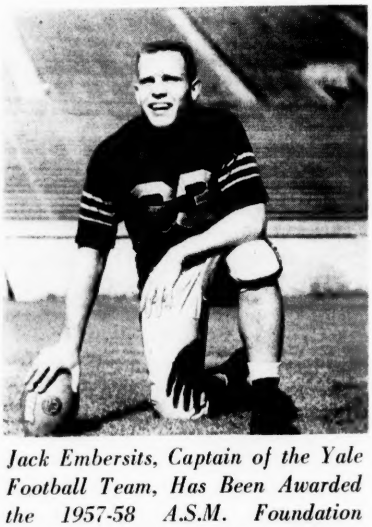
VERNE H. SCHNEE, a member of the Washington Chapter since 1949 and an A.S.M. member since 1939, died late in September of a heart attack. Mr. Schnee, 59, was a metallurgist and government adviser on defense materials. For the past eight years he had been executive director of the Materials Advisory Board of the National Academy of Science-National Research Council.

Born in Cleveland, he graduated from Cornell University in 1919 and in 1921 was a Welsbach Fellow with the U. S. Bureau of Mines. After teaching briefly at Cornell and spending some years in private industry, he became assistant director of Battelle Memorial Institute and director of the University of Oklahoma Research Institute. He served as vice-president of the University until 1949.

WILLIAM THOMAS MCCULLOUGH, for many years an active member of the Chicago Chapter before his retirement from Goodman Manufacturing Co. in 1947, passed away recently in Alhambra, Calif.

J. ROBERT MACALLISTER, president of the Syracuse Heat Treating Corp., died late in August. Mr. MacAllister, past chairman of the Syracuse Chapter, was the author of a book entitled "Manual for Heat Treating Service".

Wins Scholarship



Jack Embersits, Captain of the Yale Football Team, Has Been Awarded the 1957-58 A.S.M. Foundation Scholarship in Metallurgy. This is the second year that Jack, who is at the top of his class as a metallurgical engineering student, has received the A.S.M. Scholarship. A native of Pittsburgh, Jack keeps in shape by working in the steel mills in his home town in summer months

How Zinc Controls Corrosion Subject At Ottawa Valley

Speaker: D. N. Fagg
Consolidated Mining and Smelting Co. of Canada Ltd.

"Zinc Controls Corrosion" was the subject of an address given before the **Ottawa Valley Chapter** by Dennis N. Fagg, technical service engineer, Consolidated Mining and Smelting Co. of Canada Ltd.

Mr. Fagg discussed the high annual loss of iron and steel caused by corrosion, estimated to be 5½ billion dollars annually in the United States alone. It is apparent, therefore, that to alleviate this condition, intelligent use of protective measures is required.

Zinc has been the most widely used metallic coating for protecting iron and steel for more than 100 years, and in spite of many advances made in the field of protective coatings, it is generally recognized that zinc still retains its position as the material which provides the most economical long-term protection. In the field of metallic coatings, zinc is applied either by hot dip galvanizing, electrogalvanizing, metal spraying, sherardizing, or as a zinc-rich paint.

Although hot dip galvanizing is the oldest known method of applying zinc coatings, it was only during the past 30 years that any significant improvements have been made in the industry. Modernization of plant and equipment, combined with a better understanding of the various reactions which influence coating quality, have resulted in extensive use of hot dipped coatings on a wide variety of steel products. One of the most notable advancements has been the development of semicontinuous and continuous strip galvanizing lines which are used to produce 75% of the galvanized sheet at the present time. These are based on the "dry" galvanizing technique in which aluminum is added to the pot to inhibit brittle iron-zinc alloy growth in the coating. Such coatings have excellent adherence and ductility and will withstand severe bending and forming operations.

The other methods of applying zinc coatings are of a more specialized nature but the use of these methods has also shown considerable expansion. Electrogalvanizing, or more simply, zinc electroplating, provides a pure zinc coating which can be controlled to fine thickness limits. Since high temperatures are not involved, coated products suffer no distortion or reduction in mechanical properties. In the case of sprayed zinc coatings, the ease of application and the fact that any size or shape of product can be treated in situ are the principal recommendations for use of this technique. Although lacking in ductility, the corrosion resistance of such coatings has proven to be very good.

Sherardizing involves heating of parts to be treated in a closed drum containing zinc dust. Iron-zinc diffusion reactions which take place at sub-solidous temperatures provide a tightly bonded coating. Since a uniform coating is built up on all surfaces, this method is specially suitable for small parts containing undercuts, hole or notches which must be coated. In the field of protective paints, zinc-rich pigments consisting of up to 90% zinc dust and combined with suitable vehicles, provide excellent corrosion resistance at low cost of application. These are widely used for reconditioning old galvanizing, protection of exposed steel structures and similar applications.

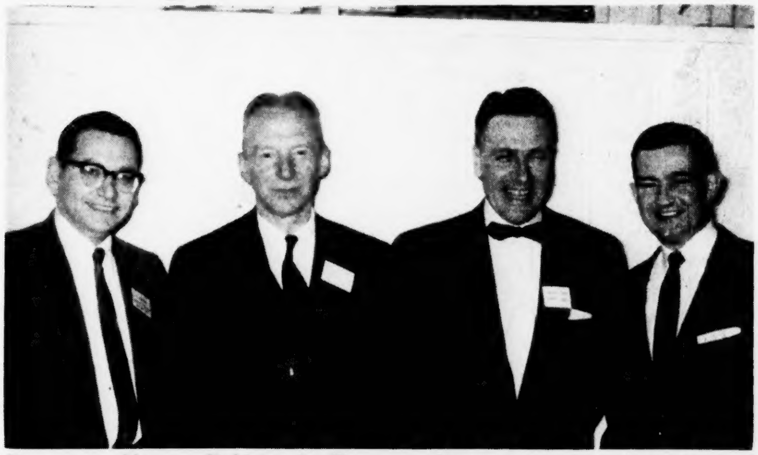
Mr. Fagg discussed the corrosion behavior of zinc coatings in various environments. With the aid of graphs he reviewed the results of a number of long-term atmosphere corrosion tests and explained that the tests revealed three important facts: the life of a zinc coating is proportional to its thickness; the life is independent of impurities in the coating; corrosion of the coating is dependent on the degree of sulphur pollution in the atmosphere.

Painting of galvanized coatings is a generally accepted practice, not only for the sake of appearance but also to provide additional protection against corrosion attack. A major difficulty is that freshly galvanized surfaces must first be prepared either by weathering or by use of primer coatings to insure good paint adhesion. Primers must be inert to the paint, but at the same time, must provide a surface receptive to it. Phosphate coatings meet these requirements but are somewhat unpleasant to handle. In addition, as is common with any primer treatment, the disadvantage of extra cost is involved. Recently developed paints containing calcium plumbate show excellent promise. These can be applied directly to a freshly galvanized surface with only a preparatory degreasing treatment being required. In tests underway for over three years, such paint coatings are still in excellent condition.

In conclusion, Mr. Fagg remarked briefly on the corrosion behavior of zinc coatings underwater, with particular reference to failure of domestic hot water tanks. Investigations have shown that needlessly severe operating conditions were the principal cause of failure. The incidence of failure was greater with soft as opposed to hard water and the practice of using copper piping with galvanized tanks was another major factor contributing to failure.

Mr. Fagg's talk was supplemented by the showing of a film entitled, "Zinc Controls Corrosion", which was provided through the courtesy of Consolidated Mining and Smelting Co. of Canada, Ltd.—**Reported by J. J. Sebisty for Ottawa Valley.**

Rolling of Steel Topic at Worcester



Shown at a Meeting Held by the Worcester Chapter Are, From Left: Leonard L. Krasnow, Technical Chairman; John H. Hitchcock, Director of Research, Morgan Construction Co., Who Spoke on "Mile-a-Minute Rolling of Steel"; Lincoln G. Shaw, Chairman; and Edward F. Grady, Assistant Secretary

—The Chain of Progress Is Forged of Metal—

As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the A.S.M. collected, edited, published and distributed over ***one hundred million pages*** **of metallurgical information.**

CHAPTER MEETING CALENDAR

Akron	**Dec. 11**	Sanginiti's		Powdered Metals
Chicago-Western	**Dec. 9**	Furniture Club	**Social**	Christmas Party
Cleveland	**Dec. 2**	Hotel Manger	**S. G. Fletcher**	Toolsteels
Columbus	**Dec. 11**	Battelle Memorial Institute		National Officers and Ladies Night
Des Moines	**Dec. 9**	Breeze House	**H. Brown**	Titanium, Is It the Wonder Metal?
Detroit	**Dec.**		**Social**	Christmas Party
Edmonton	**Dec.**		**Social**	Christmas Party
Ft. Wayne	**Dec. 9**	Hobby Ranch	**E. A. Kaiser**	Stainless Steel for Domestic Use
Hartford	**Dec. 6**	Indian Hill Country Club	**Social**	Christmas Party
Indianapolis	**Dec. 16**	Village Inn	**R. K. Beggs**	Flying Saucers—So What?
Louisville	**Dec. 3**	White Cottage Restaurant	**M. Fogg**	Special Finishes
Milwaukee	**Dec. 10**	City Club	**C. A. Furgeson**	New Developments in the Manufacture and Metallurgy of Forgings
Minnesota	**Dec. 13**	Calhoun Beach Hotel	**Social**	Christmas Party
Montreal	**Dec. 2**	Queen's Hotel	**W. S. Pellini**	Brittle Fracture in Metals
New Haven	**Dec. 6**		**Social**	Christmas Party
New Jersey	**Dec. 9**	Essex House	**Social**	Christmas Smoker
New York	**Dec. 2**	Brass Rail Restaurant		Physics of Magnetic Material
North Texas	**Dec.**		**Social**	Christmas Dinner-Dance
Notre Dame	**Dec. 11**	Nabicht Bros. Restaurant	**E. N. Skinner**	Metals for Space Vehicles
Oak Ridge	**Dec. 13**	Deane Hill Country Club	**Social**	Dinner-Dance
Ontario	**Dec. 6**	Prince George Hotel, Toronto	**F. A. Forward**	Infancy, Adolescence and Maturity of Metals
Oregon	**Dec. 13**	Congress Hotel	**Social**	Christmas Party
Ottawa Valley	**Dec. 3**	Mines Branch	**O. McIntyre**	New Developments in the Field of Grinding
Peoria	**Dec. 9**	American Legion Building	**H. J. Bates**	Heat Treatment of Gears
Philadelphia	**Dec. 13**	Penn Sherwood	**Social**	Christmas Party
Philadelphia-Jr. Section	**Dec.**		**Social**	Christmas Party
Pittsburgh	**Dec.**	Gateway Plaza	**Social**	Winter Festival
Rhode Island	**Dec. 4**	Johnson's Hummocks Grill	**R. R. Ruppender**	Nicrobrazing
Rockford	**Dec. 11**		**Social**	Ladies Night
Rome	**Dec. 3**	Trinkus Manor	**Tour**	Sanderson-Halcomb Works, Crucible Steel Co. of America
St. Louis	**Dec. 7**	Coronado Hotel	**Social**	Christmas Party
Texas	**Dec. 3**	Ben Milam Hotel	**C. F. Hiller**	Ladies Night
Tri-City	**Dec. 10**	American Legion	**A. G. Gray**	Metallurgical Progress
Utah	**Dec. 20**	New House Hotel	**Social**	Christmas Party
Washington	**Dec. 9**	American Assoc. of University Women	**J. B. Jones**	Ultrasonic Welding
West Michigan	**Dec. 16**	Schnitzelbank Restaurant	**G. D. Pfaffmann**	Induction Heat Treating
Worcester	**Dec. 11**	Hickory House	**P. G. Nelson**	Deep Drawing and Forming of Carbon and Stainless Steels
York	**Dec. 11**	Lancaster	**Tour**	Lukens Steel Co.

New Jersey Holds Annual Wyzalek Night

The New Jersey Chapter Presented Its Annual Wyzalek Awards to Students From Seven Vocational and Technical High Schools Throughout the State Recently. The awards are a memorial to the late John F. Wyzalek, past chairman of the Chapter, and are given for outstanding papers on metal characteristics, uses or treatments. Shown with the award winners in the second row, left, is Thomas L. Dinsmore, chairman of the vocational and technical schools committee, and second row, right, immediate past chairman J. J. Hauptly. Following the awards, members and guests enjoyed a talk and movie on the guided missile, NIKE, which was presented by S. D. Page of the New Jersey Bell Telephone Co. (Reported by Milton Margolis for the New Jersey Chapter)

Describes Hardships of Mining in North Country

Speaker: A. E. Moss
Iron Ore Co. of Canada

A. E. Moss, chief engineer, Iron Ore Co. of Canada, addressed a meeting of the **Ottawa Valley Chapter** on the subject "Operations of the Iron Ore Co. of Canada at Knob Lake".

The speaker first showed to his audience a narrated film depicting the problems and almost insurmountable difficulties that had to be overcome in opening up the iron ore country. After the film, Dr. Moss described the operations of the company and stressed numerous problems which had to be overcome in mining the ore. One of them was the constant battle against the ravages caused by the extreme cold, as low as 55° F. below zero, lasting for several weeks and even months. All the heavy machinery used outside is designed to withstand temperatures down to −40° F. When the temperature drops below this and remains at these lower levels, the metal parts become brittle and break. Hence, the maintenance problem is an extremely serious one.

Another problem described by the speaker was that caused by the permafrost. When permafrost penetrates parts of these ore bodies, it becomes extremely difficult to fragment the ore by blasting since the material acquires an elastic property similar to rubber. Overcoming this by secondary blasting requires additional expense which, in its turn, results in higher cost per ton.

The outstanding feature of the speaker's address was his description of ore control which made possible the sorting of Bessemer, non-Bessemer and manganiferous ores from complex ore bodies and the shipping of enormous tonnages of these ores according to rigid specifications of buyers. Discussion, which followed the address, emphasized the thoroughness with which the ore control had to be accomplished since any slip would have resulted in financial losses to the company.—**Reported by L. E. Djingheuzian for Ottawa Valley.**

Heat Bath Salesmen Meet

The Heatbath Corp. Conducted a Three-Day Meeting in Chicago Recently to Bring Together Its District Sales Representatives for a Sales Meeting and a Tour of the Company's Expanded Facilities at the Chicago Plant. Present at the meeting were, back row, from left: D. R. Barber, general manager; J. B. Wheeler, Indianapolis; E. A. Walen, Jr., vice-president; R. Shepard, Chicago; and G. P. Ott, Cleveland. Front row, from left: B. Ifkovits, Chicago plant manager; M. A. Focht, Chicago; J. C. Drinkwater, Detroit; and G. Nick, Chicago. (Photo by Heatbath Corp.)

To Head Fort Wayne During 1957-58

Incoming Officers of Fort Wayne Chapter for 1957-58 Include, From Left: George Hemmeter, Vice-Chairman; Andrew Van Echo, Chairman; Dick Hemphill, Secretary; and Jim Crosbie, Treasurer. (Reported by N. McClymonds)

Talks in Milwaukee on Furnace Atmospheres

Speaker: O. E. Cullen
Surface Combustion Corp.

Orville E. Cullen, chief metallurgist, Surface Combustion Corp., discussed the "Preparation and Application of Furnace Atmospheres" at a meeting of the **Milwaukee Chapter.**

Mr. Cullen reviewed the history of the development of presently used types of furnace atmospheres and atmosphere generating equipment. The nature of the reactions between furnace atmospheres and iron were described. The principal reactions were classified as oxidizing, reducing or carburizing. Only the reversible reactions are the truly controllable types.

Furnace control for carburizing processes involving carbon-bearing atmospheres, and means for measuring and controlling the carbon potential of furnace atmospheres were the topics stressed by Mr. Cullen. The primary carburizing gas might be considered to be carbon monoxide. Natural gas or propane are added as enriching gases to maintain the carburizing potential of the carbon monoxide content in the carburizing atmosphere. The source of this carburizing gas is from the reaction of air and hydrocarbon gases in an endothermic-type atmosphere generator.

Mr. Cullen stated that dew point measurements are the most satisfactory method of measuring and controlling the carbon potential of furnace atmospheres. Dew point measurements can be more easily observed than Orsat measurements of small percentages of carbon dioxide gases. Dew points usually vary in the range of +7 to +35° F., depending on the carbon range of the steel and the carburizing cycle in the furnace. In the early stages of the cycle, a higher carbon potential is required which necessitates a higher hydrocarbon enriching gas addition. The dew point of the carburizing gas at this point in furnace was shown to be +7° F. for a particular application. The carbon potential requirement decreased during the later diffusion and cooling portions of the cycle which resulted in decreased hydrocarbon demand and an atmosphere dew point in the range of +35° F. The importance of being able to measure small amounts of impurity gases and methods of obtaining a representative gas sample were discussed.—**Reported by J. D. Sullivan for Milwaukee Chapter.**

—Developing Metals Today . . . for Marvels of Tomorrow—

Discusses Titanium at Meeting of Golden Gate

Speaker: D. W. Levinson
Armour Research Foundation

David W. Levinson, supervisor of nonferrous metals research, Armour Research Foundation of Illinois Institute of Technology, presented a talk to members of the **Golden Gate Chapter** on "Titanium". Dr. Levinson reviewed various production methods, discussing the basic principles of the Kroll sponge process and then entering into the status of development of some newer extraction techniques. The physical metallurgy of titanium and titanium alloy was considered from the standpoint of phase diagram types. The present status of alloy development and the outlook for future titanium alloy application was discussed.

In considering the physical metallurgy of titanium, alpha, beta and alpha-beta type alloys constitute three main phase diagram types. The merit and usefulness of each group was explained. Mechanical properties were related to the mechanism of transformation in alpha-beta types of alloys and the resultant microstructure.

The basis for control of mechanical properties through heat treatment lies in the controlled rejection of the alpha phase in a beta or alpha plus beta matrix, which is essentially an age hardening process. In these terms one can readily understand the effects on the mechanical properties under stress at elevated temperatures. The use of these principles in alloy design constitutes a valuable tool for the alloy design engineer.—**Reported by F. R. Sullivan for Golden Gate Chapter.**

—The Future Rises on a Frame of Metal—

Outlines Fundamentals of Radioisotopes at Tri-City

Speaker: John Graham
International Harvester Co.

John Graham, manager, materials engineering department, International Harvester Co., and a past chairman of the chapter, opened the fall season of the **Tri-City Chapter** with a talk on "Fundamentals of Radioisotopes". He outlined the basic structure of the atom and the methods of formation and disintegration of isotopes, pointing out that isotopes are atoms of an element distinguishable by their atomic weight.

The various types of radiation given off by the unstable isotopes were described. Mr. Graham used a Geiger counter to demonstrate the detection of alpha, beta and gamma rays. He then outlined the practical uses of radioisotopes in other fields, and described the effect of radiation on matter, such as the killing of bacteria by sterilization, genetics, therapy, insect control, etc.

He then outlined the practical uses in radiography and thickness measurement of materials outlined. The use of tracing techniques and the detection of minute quantities of radioisotopes were discussed. Mr. Graham stated that this procedure is used in making wear studies, leak detections, fertilizer and many other studies. He emphasized the importance of proper shielding and care in the handling of radioisotopes.—**Reported by E. A. Welander for Tri-City Chapter.**

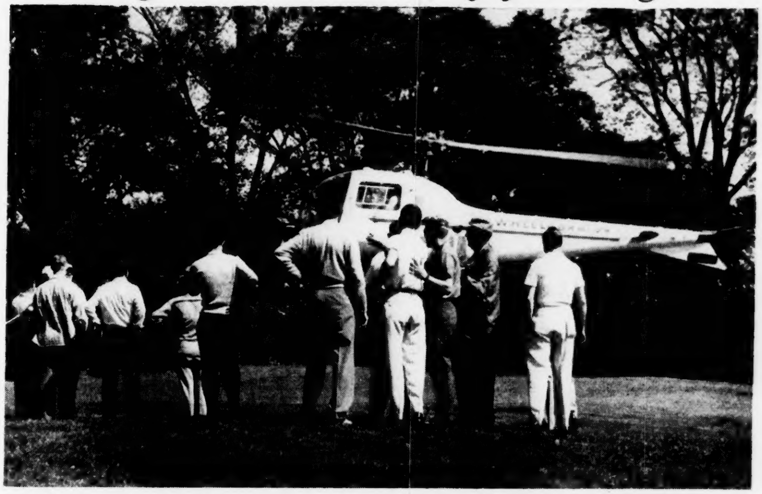
Conducts Course on the Annealing of Carbon Steel

Alexander R. Troiano, professor and head of the metallurgical department at Case Institute of Technology, directed a concentrated, two-day International Symposium on the "Annealing of Low Carbon Steel" at Case on Oct. 29-30. Invitations were issued to 150 of the top steel specialists in 17 countries throughout the world. The symposium was a cooperative effort on the part of the Lee Wilson Engineering Co., Inc., and Case.

Experts from six nations delivered a dozen papers on annealing processes during the five general sessions. Following the symposium, many of the visiting metallurgists journeyed on to Chicago for the Second World Metallurgical Congress.

Dr. Troiano, on the Case faculty since 1949, received the Howe Medal from A.S.M. in 1956 for his contributions to research in metallurgy during 1955.

Saginaw Members Enjoy Outing



The Saginaw Valley Chapter Opened Its 1957-58 Year With an Outing at the Brookwood Golf Course Near Flint. Some 200 members enjoyed a day of golfing, cards, food and prizes. One of the high-lights of the day was a helicopter ride. Shown is a group of members waiting their turn for a flight

Discusses Nuclear Reactor Vessels

Roy E. Lorentz, Jr., Combustion Engineering, Inc., Spoke on "Fabrication of Large Nuclear Power Reactor Vessels" at a Meeting of the Chattanooga Chapter. Shown, from left: John Pikciunas, chairman; Mr. Lorentz; and Gayle Wadsworth, Chapter treasurer. (Photograph by Robert J. Bradshaw, Jr.)

Speaker: Roy E. Lorentz, Jr.
Combustion Engineering, Inc.

The **Chattanooga Chapter** heard Roy E. Lorentz, Jr., assistant to director, Metallurgical Division, Combustion Engineering, Inc., speak on "Metallurgical Considerations in the Fabrication of Large Nuclear Power Reactor Vessels".

Using slides made from photographs of vessels made in Combustion Engineering shops, Mr. Lorentz showed examples of metallurgical, design and welding problems which must be solved in the construction of reactors.

The construction of parts made from Type-347 stainless steel, especially where high restraint is involved, may give rise to stress rupture cracking in the heat-affected zone of the base material. These problems can sometimes be met by control of welding sequence and use of intermediate heat treatments. Control of weld metal analysis is required to eliminate weld microfissure cracking.

Nuclear reactor vessels require welding to close tolerances and specific heat treatments to insure dimensional stability for machining. They must be designed to allow adequate nondestructive examination and to not allow crevices for corrosion or stress concentration, or stress corrosion, particularly where stainless steel is involved.

Using the main vessel of the reactor recently made by Combustion for Westinghouse Electric Corp., Mr. Lorentz showed examples of the metallurgical and welding problems that had to be solved in fabricating a vessel designed to operate at 2500 psi. and approximately 600° F. The vessel was made of manganese-molybdenum steel approximately 8-¼ in. thick with all surfaces in contact with the pressurized water clad with stainless steel. Through welds of 8 to 10 in. depth had to be made to meet rigid X-ray inspection; segments of the shell and head had to be preformed; and parts clad with stainless steel by automatic or hand welding of stainless deposit—a process that called for careful control of welding technique and chemical analysis of deposited metal. Intermediate and final heat treatments had to be worked out to give Charpy impact values of 30 ft. lb. at +10° F. on the finished vessel.

The development of welding procedures and testing of the finished vessel called for many destructive as well as nondestructive tests; 15,000,000-volt Betatron equipment for radiography allowed the inspection of welds up to 12 in. thick in which the amount of slag or porosity allowable is very small.—**Reported by J. H. McMinn for Chattanooga.**

Labor Relations Talk Opens Season

Martin H. Schneid (Right), National Labor Relations Board, Spoke on "Labor Relations" at the Opening Meeting of the Fort Wayne Chapter This Season. He is shown with Fred Jaessing, technical chairman of the meeting

Speaker Martin H. Schneid
National Labor Relations Board

Members of the **Fort Wayne Chapter** heard Martin H. Schneid, chief field examiner, 13th Region, National Labor Relations Board, speak on "Labor Relations" at their first meeting of the current season.

Mr. Schneid pointed out that the basic difference between the field of human science and the field of natural science is in the lack of measurements available in human science. When dealing with humans every case is different and conditions are continually changing.

In tracing the history of labor legislation, Mr. Schneid pointed out that very little existed prior to the early 1930's. The first major legislation was the Wagner Act. The salient aspects of the Wagner Act were discussed as well as the important changes wrought by the Taft-Hartley amendments.

Emphasis was placed on the Board's and Courts' present application of legislation to current labor relations. Loop-holes and possible future legislation were also discussed. The session was concluded with discussion of questions from the audience.—**Reported by Norman L. McClymonds for Fort Wayne Chapter.**

Rockford Executive Committee Meets

Shown at a Meeting of the Executive Committee of the Rockford Chapter Are, From Left: R. R. Simonovich, Secretary; J. F. Sisti, Program; C. D. Reiter, Arrangement; C. Nivinski, Jr., Entertainment; D. A. Campbell, Chairman; E. W. Rainey, Board; R. P. Korff, Board; R. L. Snygg, Assistant Treasurer and Board; G. Engle, Board; H. Habecker, Student Affairs; C. L. Nelson, Publicity; W. Helm, Guest of Mr. Werckle; R. D. Werckle, Treasurer; G. Sandstrom, Reporter; J. B. Sproch, Yearbook; Q. C. Bowen, Jr., Vice-Chairman; J. Sturm, Board; and K. Hein, Educational Committee

Compliments

To WILLIAM G. PFANN, of the metallurgical research department, Bell Telephone Laboratories, on being awarded the Francis J. Clamer Medal by the Franklin Institute in recognition of his discovery and application of zone refining to metals and other crystalline substances. Mr. Pfann is a member of the New Jersey Chapter.

♦ ♦ ♦

To the MILWAUKEE CHAPTER, on the unusual success of its educational series which started late in September. The Chapter, with a membership of a little over 600, had 480 and 470 persons present at the first two lectures on the "Heat Treatment of Steel."

♦ ♦ ♦

To R. D. CHAPMAN, present chairman of the Transactions Committee A.S.M., who has been appointed to the position of assistant chief engineer, metallurgical research, by Chrysler Corp.

♦ ♦ ♦

To BATTELLE MEMORIAL INSTITUTE, on being one of a group of organizations to receive a 1957 Chemical Engineering Biennial Achievement Award. Battelle was cited specifically for achievements in the field relating to uranium and titanium.

♦ ♦ ♦

To ROBERT E. FLEMING on being elected executive vice-president of the Industrial Heating Equipment Association, to succeed Carl L. Ipsen who retired Sept. 30. A native of Oakland, Calif., Mr. Fleming attended St. Mary's College and University of California, and Georgetown University. His government service, all in the metalworking equipment field, included assignments in the Advisory Commission Council of National Defense, Office of Production Management, War Production Board and Department of Commerce.

R. E. Fleming

In industry, Mr. Fleming was an associate in the Machine Steel Products Corp., president of R. Fleming & Co. and partner in Ajax Investment Co.

He has just recently returned from India where he served as a member of the U. S. Machine Tool Delegation which studied the Indian machine tool industry and made recommendations for increased production required for India's second Five-Year Industrialization Program.

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research, Western Reserve University, Cleveland, With the Cooperation of the John Crerar Library, Chicago.

Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts*.

A General Metallurgy

417-A. Regeneration of Waste Pickle Liquor to Produce Ferrous Sulfate Monohydrate. J. S. Atwood, J. S. Joseph, and W. W. Hodge. *Blast Furnace and Steel Plant,* v. 45, Sept. 1957, p. 1018-1023.

Neutralization processes; use of sulphuric acid as a descaling medium and its regeneration; description of process. Above 10,000 gal. per day of waste acid the monohydrate process presents the cheapest disposal method now available. 7 ref. (A8b, L12g)

418-A. Chemicals From Steel Plants. *Chemical and Engineering News,* v. 35, Aug. 26, 1957, p. 19-22.

Table of chemicals produced; economics. (A11c; ST)

419-A. An Integrated Waste Disposal Method. L. E. Lancy. *Electroplating and Metal Finishing,* v. 10, Aug. 1957, p. 251-253.

Treatment of workpieces and wash water with chlorine and sodium hydroxide breaks down cyanide plating solutions, and sulphur dioxide with sodium and calcium carbonates reduce chromate-containing effluent. (A8b, L17)

420-A. Increasing Use of Hazardous Metals Poses New Extinguishing Problems. Roi B. Woolley. *Fire Engineering,* v. 110, Aug. 1957, p. 796-799.

Control of magnesium, zirconium and titanium fires. (A7p; Mg, Zr, Ti)

421-A. Brass Foundry Salvage Practice. Harry St. John. *Foundry,* v. 85, Oct. 1957, p. 121-123.

Importance of segregation of alloys, reclamation processes and refining. (A11d; Cu-n)

422-A. French Steel Industry. *Indian and Eastern Engineer,* v. 120, June 1957, p. 397-400.

Raw material supply, equipment, products, research, economics. (A4, A9, 1-2; ST)

423-A. How to Get More for Your Metalworking Dollar. Pt. 11. Copper and Brass. *Iron Age,* v. 180, Sept. 5, 1957, p. 115-130.

Strength, corrosion resistance, electrical conductivity and other factors involved in selecting correct copper alloy for job at hand; suggestions and techniques for machining, drilling, milling, finishing, forging and joining copper-base alloys. Data on casting alloys; their mechanical and physical properties; casting defects and causes; information on standard wrought copper alloys includes nominal composition; physical properties, mechanical properties, corrosion resistance, fabricating processes and properties. (A general, S22, 17-7; Cu)

424-A. New Materials That the Design Engineer Should Know About. Metallic Materials. Charles R. Simcoe. *Mechanical Engineering,* v. 79, p. 720-724.

Information on newly developed materials including composition and mechanical properties of new titanium alloys, ultra-high-strength steels, nickel-base alloys, and potential uses for beryllium, columbium and rhenium. 7 ref. (A general, 17-7, 17-1; Ti, ST, Ni, Be, Cb, Re)

425-A. Science for Electroplaters. Pt. 27. Waste Disposal. Pt. 3. L. Serota. *Metal Finishing,* v. 55, Aug. 1957, p. 69-71.

Common methods of chemical treatment for toxic wastes in plating operation effluent. (A8b, L17)

426-A. A Survey of Air Treatment Systems in Use in the Metal-Finishing Industries. Leo Walter. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 323-325, 338.

Factors in designing dust or fume exhaust systems. (A8a, L general)

427-A. Manganese, Its Minerals, Deposits and Uses. John N. Hoffman. *Mineral Industries Experiment Station, Pennsylvania State University Circular No.* 49, 1957, 126 p.

Properties, classification, foreign and domestic deposits, consumption and production; bibliography. (A general; Mn, RM-n)

428-A. Water. A Global Problem for Electroplaters. David Milne and D. Gardner Foulke. *Plating,* v. 44, Aug. 1957, p. 859-863.

Approach to water problem centers on economic use; control of effluent water and storage of runoff water, with special emphasis on factors concerning water conservation by electroplating industry. 13 ref. (A11, L17, NM-a38)

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full within the next few months. A schedule of the principal headings in the revised version was published in the February issue.

429-A. Cyanide Waste—Oxidized in the Plating Room. E. A. Hill and F. J. Neff. *Plating,* v. 44, Aug. 1957, p. 864-868.

Design and operation of alkaline chlorination system of cyanide waste treatment. 4 ref. (A8b, L17)

430-A. Low-Cost Integrated Waste Treatment at American Sterilizer. John Stroh and Clifford Allen. *Plating,* v. 44, Aug. 1957, p. 869-872.

Case histories of integrated plating waste treatment systems involving wash tank with alkaline chlorination before water rinse to oxidize cyanide wastes, and reduction wash of sulphur dioxide followed by precipitation with sodium and calcium carbonate solutions for treating chromate wastes. (A8b, L17)

431-A. Current Trends in Plating Waste Abatement. C. Fred Gurnham. *Plating,* v. 44, Aug. 1957, p. 873-878.

Engineering design in plating waste treatment and water use. (A8b, L17)

432-A. Bibliography on Metal Finishing Wastes, 1956. C. F. Gurnham and D. G. Foulke. *Plating,* v. 44, Aug. 1957, p. 916-918.

Bibliography lists 55 articles. (A8b, L general, 11-15)

433-A. Aqueous Reprocessing—An Introduction. R. B. Richards. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 1-21.

Summary and comparison of processes; key development problems; future utilization of aqueous processes. (A11d, T11g, C general)

434-A. Dissolution and Feed Adjustment. R. E. Blanco. Paper from "Symposium on Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 22-44.

A brief summary of the chemistry of the dissolution and feed adjustment steps. 23 ref. (A11d, T11g; U, Al)

435-A. Redox Process—A Solvent Extraction Reprocessing Method for Irradiated Uranium. S. Lawroski and M. Levenson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 45-68.

This process uses Hexone (methyl isobutyl ketone) for solvent extraction, $Al(NO_3)$ for common ion salt-

ing effect, and $FE(SO_3NH_2)_2$ and $Na_2Cr_2O_7$ for the reduction and oxidation of plutonium, respectively. (A11d, C19, T11g; Pu)

436-A. Application of the Packed Column to the Redox Process. E. R. Irish. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 69-82.

Performance characteristics determined for packed solvent extraction columns during development work are capabilities, mass transfer effectiveness, and operating peculiarities. Instrumentation for control and observation of performance is described briefly. (A11d, C19, T11g)

437-A. Purex Process—A Solvent Extraction Reprocessing Method for Irradiated Uranium. E. R. Irish and W. H. Reas. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 83-106.

A description of the over-all process, utilizing tri-butyl phosphate solvent (in a kerosene-type diluent) and nitric acid salting agent; chemical process flowsheets. The process chemistry of uranium, plutonium, and fission products as affected by process variables. 12 ref. (A11d, C19, T11g)

438-A. Solvent Extraction Processes for Enriched Uranium. C. E. Stevenson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 152-179.

Solvent extraction processes for enriched uranium are similar to the Purex and Redox processes for natural uranium except that plutonium separation and recovery is not attempted, and the processes generally must provide for the separation of diluent metals in the fuels. (A11d, C19, T11g; U)

439-A. Thorex Process. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 180-222.

The Thorex process was developed to recover U^{233} and thorium from irradiated thorium. Thorex pilot plant operating experience over the last two and a half years is reviewed, the current flowsheet presented and evaluated, and recent developments in Thorex process chemistry described. 9 ref. (A11d, C19, T11g; Th, U)

440-A. Auxiliary Processes: Introduction. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 225-243.

Methods for converting unusual fuels, such as those employed in power reactors, into a solution which is amenable to solvent extraction treatment as practiced in present day reprocessing plants. (A11d, C19, T11g)

441-A. Present Dissolution Methods for Zirconium and Stainless Steel. C. M. Slansky. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 244-250.

Uranium recovery processes are described for nuclear fuels alloyed and clad with zirconium and with Types 304 and 347 stainless steels. (A11d, C19, T11g; U, Zr, SS)

442-A. Alternate Processing Methods for Zirconium and Stainless Steel Containing Fuels. R. E. Blanco. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* p. 251-261.

Development program for alternate processing methods for developing universal methods for converting all fuels of a given type, as for example zirconium or stainless steel, to a nitrate form suitable for purification by solvent extraction. A number of methods are surveyed. 13 ref. (A11d, C19, T11g; Zr, SS)

443-A. Removal of Fission Products From Feeds. Merle K. Harmon. Paper from "Symposium on the Reprocessing of Irradiated Steels." *U. S. Atomic Energy Commission,* TID-7534, p. 262-276.

Separation of ruthenium, zirconium, and columbium. (A11d, C19, T11g; Ru, Zr, Cb)

444-A. Tail End Treatment for Zirconium-Niobium Removal. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 277-285.

Zirconium and columbium are two of the most troublesome fission products associated with uranium recovered by the tributyl phosphate process. It has been found that both of these elements are removed by passage of the uranium product solution through a silica gel bed. 6 ref. (A11d, C19, T11g; Zr, Cb)

445-A. Performance of a Plutonium Reflux Solvent Extraction System. B. F. Judson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 296-302.

Semi-works performance of the reflux flowsheet; advantages and disadvantages of employing product refluxing as a solvent extraction technique. (A11d, C19, T11g; Pu)

446-A. Ion Exchange Isolation Processes. F. R. Bruce. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 303-331.

Ion exchange processes have been developed which both concentrate the fissionable material and give additional separation from corrosion and fission products. The processes were developed specifically for the plutonium product from the Purex and Redox processes and the uranium from the Thorex process. 12 ref. (A11d, C19s, T11g; Pu, U)

447-A. Conversion Chemistry of Plutonium Nitrate. K. M. Harmon and W. H. Reas. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 332-347.

Procedures in the conversion of plutonium from plutonium nitrate-nitric acid solutions to plutonium metal. (A11d, C19, T11g; Pu)

448-A. Effluent Disposal Considerations and Summary of Methods Used. C. E. Stevenson. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 351-361.

Problems involved in the disposal of effluent other than products from the chemical processing of nuclear fuels for fissionable material recovery are discussed. Major considerations of effluent treatment are outlined and the types of effluents listed and described. (A8c)

449-A. Retention of High Level Radioactive Wastes. A. M. Platt. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 389-406.

The operating experience of prime contractors for the United States Atomic Energy Commission in the retention of radioactive wastes by underground tank storage, waste scavenging, and ground disposal techniques. Some of the engineering, economic, and biological hazard aspects of these operations. 5 ref. (A8c)

450-A. Ultimate Disposal of Radioactive Wastes. W. A. Rodger and P. Fineman. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 407-454.

Methods of discharging liquid wastes to the environment (ocean or earth); several methods of reduction of liquid wastes to solids show promise. 37 ref. (A8c)

451-A. Unit Costs and Economic Relationships for Certain Radioactive Waste Disposal Steps. F. L. Culler, J. O. Blomeke and W. G. Stockdale. Paper from "Symposium on the Reprocessing of Irradiated Fuels." *U. S. Atomic Energy Commission,* TID-7534, p. 455-475.

A generalized scheme for waste disposal flowsheet is given. Costs have been accumlated or estimated for certain steps in the over-all waste disposal scheme. 6 ref. (A8c, 173)

452-A. Symposium on the Reprocessing of Irradiated Fuels, Held at Brussels, Belgium, May 20-25, 1957. *U. S. Atomic Energy Commission,* TID-7534, 1957, 475 p.

The collection is in three parts (books) dealing with aqueous reprocessing, non-aqueous reprocessing and the engineering and economic aspects of reprocessing. Metallurgical papers are abstracted separately. (A11d, C19, T11g)

453-A. Titanium—A Materials Survey. J. A. Miller. *U. S. Bureau of Mines. Information Circular* 7791, Sept. 1957, 202 p. (CMA)

Chapter headings are: Consumption, properties and uses; mineralogy and geology of titanium deposits; resources; prospecting, mining and beneficiation; processing; fabrication of metal; structure of the industry; supply and distribution; marketing; prices; self-sufficiency and political control; public policy and national defense; selected bibliography. 309 ref. (A general; Ti)

454-A. Literature Survey on Leaded Steels. R. C. Elliott and D. M. Koffman. (Watertown Arsenal Laboratory), *U. S. Office of Technical Services,* PB 111917, July 1955, 38 p. $1.00.

Machining costs can be cut considerably through use of leaded steels where large amounts of machining per unit volume of steel are needed. This conclusion was drawn from an evaluation of published information on the manufacture, fabrication, and properties of leaded steels. The project was undertaken with the aim of utilizing leaded steels for ordnance applications as a means of reducing manufacturing costs. It was found that lead addition to normal steel grades does not decrease ductility or toughness. (A general, G17k, Q general, T2, 17-7; ST, *Pb*)

455-A. (German.) **The Utilization of High Copper Scrap Metal.** Wilhelm Kaiser. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 404-409.

Various processes for the recovery of copper from scrap metals

are discussed and evaluated as to the losses which must be sustained. New processes, being tried at present, promise to give improved results. (A11d; Cu, RM-p)

456-A. Dust Control in Foundries. W. B. Lawrie, A. T. Holman and J. L. Burgess. *Foundry Trade Journal,* v. 103, Sept. 12, 1957, p. 303-306.

Description of recent work on low-volume high-velocity exhaust system. Good dust control was achieved when operating on dust clouds within the respirable-size range. 6 ref.
(A8a, W13c, 1-2, E general)

457-A. Materials of Construction—Less Common Metals. E. M. Sherwood. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1612-1617. (CMA)

Reviews of the literature of the production, properties, alloys, corrosion resistance, and heat treatment of zirconium, hafnium, molybdenum, columbium, tantalum, rhenium and chromium. 143 ref. (A general; Zr, Hf, Mo, Cb, Ta, Re, Cr, SGB-s)

458-A. Materials of Construction—Titanium. H. B. Bomberger. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1658-1662. (CMA)

The producers, production statistics, price, properties, and fabrication of titanium are reviewed. A graph shows the corrosion rate of anodized and unanodized titanium in common mineral acids in high concentrations. 72 ref.
(A general; Ti, SGB-s)

459-A. Explosion of a Titanium Crucible. C. E. Armantrout and J. R. Hauger. *Metal Progress,* v. 72, Sept. 1957, p. 94-95. (CMA)

An explosive reaction was observed at a Bureau of Mines laboratory involving titanium and highly oxidizing Na_2O_2-Na_2CO_3 flux. No explosion occurred when a zirconium crucible was substituted.
(A7p; Ti, Zr)

460-A. Titanium Upgraded in New 10 Ft. Vacuum Furnace. *Western Metals,* v. 15, Sept. 1957, p. 54. (CMA)

Much hydrogen-embrittled titanium is being salvaged for the aircraft and missile industry by heating in a vacuum furnace at Hollywood Heat Treating Co. The furnace is 10 ft. deep and 8.25 ft. in diameter, will reach a vacuum of 1/10th micron and a temperature of 2200° F. Extensive electrical equipment is involved.
(A11d, W18, 1-23; Ti)

461-A. Boron-Needled Plain Carbon Cast Steel. Ya. E. Gol'dshtein, L. L. Pyatakova and O. D. Zhizhakina. *Vestnik Mashinostroeniya,* v. 36, no. 7, 1956, p. 23-27. (*Henry Brutcher Translation* no. 3986.)

Previously abstracted from original. See item 166-V, 1956.
(A general; Cn, *B*, 5)

462-A. (French.) **Chronicle of Steelmaking: Historical and Technical Development of the Blast Furnace.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3505, June 1957, p. 339-341.

Blast furnaces from wood-burning type of 16th century to present. Contributions of various countries to design, process improvements, etc. 9 ref. (A2, D1, W17g, 1-2)

463-A. (French.) **Chronicle of Steelmaking. Historical Development of Steel-Producing Furnaces.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3506, July 1957, p. 406-408.

Thomas converters, Martin furnaces, electric furnaces. 7 ref.
(A2, D general, 1-2; ST)

464-A. (Italian.) **The Technique of Fabrication of Etruscan Mirrors.** C. Panseri and M. Leoni. *Fonderia Italiana,* v. 6, Aug. 1957, p. 309-317.

Chemical, metallographic and sclerometric study of ten mirrors found in graves in various parts of Etruria gives evidence of high technical skill attained by Etruscans in field of bronze metallurgy. 5 ref.
(A2, T9q, 17-7; Cu-s)

465-A. (Italian.) **Augusto Vanzetti, Italian Steel Foundry Pioneer.** B. Boni. *Fonderia Italiana,* v. 6, Aug. 1957, p. 319-327.

Life (1846-1894) and work of man who introduced Roberts converter into Italy and was first director of engineering at Terni Steel Works.
(A2, E general; ST)

B Ore and Raw Material Preparation

102-B. New Taconite Process. *Chemical and Engineering News,* v. 35, Sept. 16, 1957, p. 72-73.

Fuel economy and hardest pellets yet feature Allis-Chalmers' pilot plant operation. (B16b; Fe)

103-B. Symposium on Cyclones. R. H. Lowe and F. D. DeVaney, Chairmen. *Mining Engineering,* v. 9, Aug. 1957, p. 869-889.

Presented under the auspices of the Mineral Beneficiation Division at the 1957 meeting to present a picture of one of the developments in beneficiation. Papers abstracted separately. (B13, W15p, 1-2)

104-B. Compilation of Cyclone Operating Data. T. M. Morris. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 877-879.

Data compiled from information submitted by 24 plants using cyclones for wet classification; ore treated, dimensions and operating data of cyclone and screen analysis of product.
(B14e)

105-B. Use of Cyclones in the Grinding of Taconite. Fred D. DeVaney. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 880-882.

Use of cyclone classifiers in grinding circuit of taconite plant; data on cyclone operation, dimension, and screen analysis of product.
(B14e; Fe)

106-B. Cyclone Practice in Arizona. Russell Salter and Edwin J. King. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 883-889.

Design and flow data and screen sizing of products for cyclone classifiers, primary grinding circuit, secondary grinding circuit, open circuit desliming ahead of regrind circuit in mills of seven Arizona companies. (B13e, B13f)

107-B. Hobart Produces Rutile. *Steel,* v. 141, Sept. 2, 1957, p. 97. (CMA)

Hobart Bros. (Troy, Ohio) produces rutile ilmenite, zircon + monazite from Florida beach sands with a constant flow separator at its Winter Beach, Fla. site.
(B12, B14; Ti)

108-B. (French.) **Pelletization of Iron Ores.** *Technique Moderne,* v. 49, June 1957, p. 263-264.

Factors influencing location of pelletizing installations compared with those for calcination; features of pelletizing process; influence of pellet on blast furnace practice.
(B16b; Fe, RM-n)

109-B. (Norwegian.) **Techniques of Ore Dressing.** Magne Mortenson. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 17, no. 1, 1957, p. 6-12.

Flotation and washing processes, magnetic and electrostatic separation. Technical problems in crushing process, screening and classification of crushed ore, separation, choice of dressing process. Review of ore dressing today. 11 ref. (B13, B14)

110-B. (Portuguese.) **Experimental Study on the Production of Sponge Iron in 26% Cr Cast Iron Containers.** Tharcisio D. de Souza Santos. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 67-128.

Influence of variations in diameter of briquetts of "jacutinga" (lamellar hematite), length of reduction cycle, temperature, granulometry and composition of scrap charcoal employed on ore reduction process, percentage of reduction, carburization of metal under study. 15 ref. (B16d; Fe, 6-24)

111-B. (Russian.) **New Methods of Investigating Sintering Process.** V. S. Abramov. *Stal',* v. 17, March 1957. p. 195-199.

The method proposed for experimental sintering by means of removable pans placed on the sintering machine, which considerably widens the possibilities for investigation and control of the sintering process. 4 ref. (B16a, 1-2; Fe)

112-B. (Russian.) **Automatic Speed Control of Sintering Machines.** D. G. Khokhlov, Yu. A. Gyrdymov and M. M. Gordon. *Stal',* v. 17, June 1957, p. 481-488.

Experiments at the Vysokogorsk sintering plant with methods of control of sintering machines for obtaining full sintering; use of the waste gas temperature difference as control impulse. 5 ref.
(B16a, S18n, 1-2; Fe)

113-B. (French.) **Physical Chemistry of the Agglomeration of Iron Ores.** A. Roos. *Genie Civil,* v. 134, Mar. 15, 1957, p. 129-133.

Chemical reactions and physical and crystallographic transformations of sintering process.
(B16; Fe, RM-n)

C Extraction and Refining

286-C. Rare Earth Process Gets Trial. *Chemical and Engineering News,* v. 35, Sept. 9, 1957, p. 80. (CMA)

Horizons, Inc. is about to give R. C. Vickery's lanthanon separation method bench-scale trials. The process has a liquid ion exchange basis and uses 1M 2-diethylhexyl phosphoric acid in petroleum ether in contact with an aqueous solution of lanthanon chlorides. By regulating the pH of the ammonium citrate extractant and its weight ratio to the petroleum ether layer, the lanthanons may be preferentially extracted as individuals. (C19s; EG-g)

287-C. Electrolytic Preparation of Titanium From Fused Salts—I. Preliminary Electrolytic Studies With Diaphragmed Cells. M. B. Alpert, F. J. Schultz and W. F. Sullivan. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 555-559. (CMA)

An electrolytic process for titanium involves the reduction of $TiCl_4$ to a reduced chloride in a solution of alkali or alkaline earth chloride in a diaphragmed cell. The $TiCl_4$ is added to the cell through a hollow cathode at a controlled feed: current ratio. By controlling the melts most of the dissolved chloride is $TiCl_2$. With an inert atmosphere it is possible to obtain titanium as a coarse dendritic material which, after hydrochloric acid leaching, is readily fabricated. Factors are present for a continuous operation on a large scale. 19 ref. (C23p; Ti)

288-C. Titanium Production in Sheffield. *Engineering,* v. 184, Aug. 23, 1957, p. 235. (CMA)

Building of a titanium-melting plant at Sheffield, England by Wm. Jessop and Sons. Titanium granules from ICI mixed with appropriate amounts of alloying additions are compacted by a press. The compacts are welded into a consumable electrode in a vacuum chamber. The double-melting procedure, employing water-cooled copper crucibles, is described. (C5h; Ti)

289-C. Blast Furnace Production of Zinc. S. W. K. Morgan. *Metal Industry,* v. 91, Aug. 9, 1957, p. 105-108, 111.

Experimental work in development of blast furnace unit and liquid lead condenser; theory of blast furnace smelting and application of process to various zinc-bearing materials. (C21a; Zn)

290-C. Floating Zone Purification. *Metal Industry,* v. 91, Aug. 16, 1957, p. 132.

Application of zone refining to germanium, silicon, iron, titanium, zirconium, nickel and molybdenum, and the use of radioactive tracers for following redistribution and purification. (C28k, 14-13; Ge, Si, Fe, Ti, Zr, Ni, Mo)

291-C. Casting Large Ingots of Uranium. G. W. P. Rengstorff and H. W. Lownie, Jr. *Metal Progress,* v. 72, Sept. 1957, p. 76-78.

Sound ingots, 7 in. diameter, weighing 1200 lb. and with 91 to 95% recovery in metal can be cast in iron molds after induction melting the uranium "derbies" in magnesia or graphite crucibles under open argon atmosphere. A small amount of barium chloride, added shortly before pouring, protects the stream of molten metal from oxidation. (C5j, 1-2; U)

292-C. Superpurity Nickel Melted Under Controlled Atmospheres. K. M. Olsen. *Metal Progress,* v. 72, Sept. 1957, p. 105-109.

Research work on vacuum-tube "repeaters" for transoceanic cables requires nickel of unexcelled purity. This can be made by melting sintered slugs of carbonyl nickel powder in magnesia crucibles under a definite program of hydrogen, vacuum and helium atmospheres. The process is also effective for high-purity binary nickel alloys and iron alloys. (C5j; Ni-a)

293-C. Metallurgical Applications of Solvent Extraction. J. B. Rosenbaum and J. B. Clemmer. *Mines Magazine,* v. 48, Aug. 1957, p. 21-24.

Principles, techniques, limitations, applications and potential uses in processing ores. Solvent extraction proved ideal for processing irradiated thorium, uranium, and plutonium. 15 ref. (C19, 2-17; Th, U, Pu)

294-C. (French.) **Chromium and Ferrochromium in the Manufacture of Alloy Steels.** M. Dingeon. *Journal du Four Electrique,* no. 3, 1957, p. 87-91.

Review of metallurgical procedures and progress in manufacture of chromium for use in alloy steels. (C21; Cr, AD-n, AY)

295-C. (French.) **Direct Current in Electrochemical Metallurgy.** M. M. Dodero. *Societe Francaise des Electriciens, Bulletin,* v. 7, May 1957, p. 276-284.

Igneous electrolysis has applications in electrometallurgy and electric steelmaking, particularly in manufacture of low-alloy steels. 10 ref. (C23; AY)

296-C. (Italian.) **Refining of Heat Resistant Aluminum-Silicon Hypereutectic Alloys.** S. Gallo. *Fonderia Italiana,* v. 6, July 1957, p. 279-284.

Characteristics of three groups of heat resistant alloys used in manufacture of pistons; refining with phosphorus, titanium and boron; effect of sodium and alkaline salts on refining power of these substances. 13 ref. (C5r; Al, SGA-h, *Si*)

297-C. (Norwegian.) **Kinetic Conditions in Reduction of Oxide Ores.** T. Rosenqvist. *Tidsskrift for Kjemi Bergvesen og Metallurgi,* v. 17, no. 1, 1957, p. 1-6.

A survey of factors affecting the reduction rate; determination of useful reduction rates; experiments on gas velocity, temperature and reduction. 13 ref. (C general, D general, 3-17)

298-C. (Roumanian.) **Vacuum Dezincing of Lead.** I. V. Buda. *Revista de Chimie,* v. 8, Mar. 1957, p. 166-171.

New vacuum heating method; experiments and apparatus; results compared with those of researchers in U.S.A., U.S.S.R., and Australia. (C25; Pb, *Zn*)

299-C. Theory of Blast Furnace Zinc Production. Pt. 2. Zinc Production. S. W. K. Morgan. *Mining Journal,* v. 249, Aug. 16, 1957, p. 193-194.

Pilot production furnaces and theory of process. (C21a; Zn)

300-C. Production of Metallic Lithium on a Laboratory Scale Under Reduced Pressure. T. Szarowicz and M. Orman. *Prace Instytutow Ministerstwa,* v. 7, no. 5/6, 1955, p. 270-275. (*Henry Brutcher Translation* no. 3601.)

Previously abstracted from original. See item 107-C, 1956. (C26, C25, Li)

301-C. (Czech.) **Electrolytic Production of High-Purity Chromium.** Vladmir Dluohy and Jan Kaloc. *Hutnické Listy,* v. 12, no. 6, 1957, p. 509-515.

High-purity chromium prepared by electrolysis of aqueous solution of trivalent and hexavalent chromium salts. Examined influence on yield of bath composition and concentration, electrolyte temperature, current density, relation between surfaces of electrodes, their distance, their material, shape, preparation and arrangement. 19 ref. (C23p; Cr-a)

D Iron and Steelmaking

280-D. American Stainless-Steel Melting Practice. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 203.

Summarizes process for recovery of chromium, manganese, and iron which enter slag during stainless steel melting. (D11s, A11d; SS, Cr, Mn, Fe, RM-q)

281-D. Carbon Linings Stand Up to Long Furnace Campaign. *Iron Age,* v. 180, Aug. 29, 1957, p. 74.

Carbon hearth lining gives good service during long blast furnace campaign. (D1, W17g, RM-h)

282-D. The Liquidus and High-Temperature Properties of Blast-Furnace Slags. B. G. Baldwin. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 388-395.

Technique permitting observation of crystal growth, melting or movement of molten slag at temperatures up to 1750° C. used for measurement of liquidus temperatures of 150 blast furnace slags. Actual temperatures close to those predicted for slag composed of CaO, MgO, Al_2O_3 and SiO_2. Relation between temperatures and slag viscosity. 21 ref. (D11q, D1b; RM-q)

283-D. Heat Flow in Ingot Hot-Tops. G. Fenton. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 396-405.

Study of heat flow and balance in hot-tops of 9-in. square ingot molds over full period of steel solidification with standard firebrick and insulating brick hot-tops. Thermal capacity of refractory accounts for greatest proportion of heat loss. General recommendations for improved feeding efficiency. (D9, P11k; ST, 5-9)

284-D. Increasing Blast Furnace Output. Charles M. Squarcy and Richard J. Wilson. *Metal Progress,* v. 72, Sept. 1957, p. 210-212, 216. (Digest from "More Iron Without More Furnaces", American Iron and Steel Institute, Regional Meeting, Chicago, Oct. 17, 1956, 26 p.)

The application of several improvements to the eight blast furnaces at Inland Steel Co. Gives concrete information as to the benefits gained. A ten-year period (1947 to 1956) is covered. (D1b, Fe)

285-D. More Jobs Open for Rare Earth Additives. *Steel,* v. 141, Sept. 9, 1957, p. 112-115. (CMA)

Advantages of lanthanon additives in steelmaking include improvement in tensile, stress and impact properties, decreased hot shortness in high-alloy stainless, better nodule formation in cast iron, and control of tramp elements. Some evidence exists for grain refinement, scale suppression in forging and control of oxygen, sulphur and hydrogen. Experiences of steelmaking firms are cited. (D9r, Q general, 2-10; ST, EG-g, AD-p)

286-D. (Czech.) **Advantages of Automatic Flame Reversal in Openhearth Furnaces.** Vaclav Parma. *Hutnické Listy,* v. 12, no. 7, 1957, p. 578-585.

Principle of flame reversal and individual systems for automatic reversal; examples show improved heat work and longer checker life and simplified furnace operation upon introduction of automatic flame reversal; reversal graphs for counter current gas. (D2h)

287-D. (Czech.) **Compiling and Evaluation of Heat Balances of Openhearth Furnaces.** Vladimir Balabanov. *Hutnické Listy,* v. 12, no. 7, 1957, p. 604-609.

Methods of temperature measurement; necessity of standardization in measuring and compiling heat

balances in openhearth furnaces; data on heat balance of an openhearth. (D2h)

288-D. (French.) **Recent Developments in Blast Furnace Practice.** A. Roos. *Genie Civil,* v. 134, June 15, 1957, p. 269-277.

Chemical potential; fundamental blast furnace reactions; internal thermal mechanism of blast furnaces; relation between slag temperature and composition of reduced metal; study of stack process by means of radioactive isotopes; factors governing coke consumption; thermal balance of coke combustion. (D1, D11n; Fe)

289-D. (French.) **Economic Aspects of the Direct Reduction of Iron Ores.** R. Touttee. *Revue de l'Industrie Minerale,* v. 39, June 1957, p. 547-567.

Definition of direct reduction and economic factors governing advisability of use; technique of direct reduction, including various processes and applications in France and elsewhere; comparison with other methods for decreasing coke consumption; comparison of efficiency of direct reduction in France and U. S. A.; direct reduction and selling price-investment-balance of foreign trade picture. (D8j, A4; Fe)

290-D. (German.) **Influence of Catalysts on the Reduction of Iron Ore With Hydrogen.** Willi Machu and Said Y. Ezz. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 367-371.

The catalytic effect of 100 substances on the reduction of iron ore was investigated. Copper, nickel and platinum have positive, tungsten has negative effects. However, these effects show up only in a temperature range of 250 to 400° C. Roasting temperature after catalyst impregnation and the concentration of the catalyst are of definite importance. 10 ref. (D8j; Fe, NM-c)

291-D. (Russian.) **Blast Furnace Operation Under 1.3 Atm. Gage Top Gas Pressure.** E. G. Tetereviatnikov and V. N. Andronov. *Stal',* v. 17, March 1957, p. 200-204.

The first experiment with blast furnace operation under high top-gas pressure (up to 1.3 atm.) resulted in an improvement of the consumption coefficients of raw materials and an increase of the furnace productivity; however, this was limited by a rather poor preparation of raw materials for smelting and inadequate capacity of the hot-blast stoves. (D1h, 1-2; Fe)

292-D. (Russian.) **Gas Temperature at Working Space Outlet of an Openhearth Furnace.** V. N. Kornfeld, A. O. Voitov and V. I. Koshelev. *Stal',* v. 17, March 1957, p. 213-219.

Systematic measurement of gas temperatures of an openhearth furnace, when melting heats with and without oxygen enrichment reveals regularity in variations, characterizing the heat exchange process in the working space of the furnace. By means of the gas (smoke) control an effective automatic regulation of the thermal regime is possible. 11 ref. (D2h, S16)

293-D. (Russian.) **Rise of Temperature of Openhearth Bath on Blowing With Compressed Air.** M. Ia. Medzhibozhsky and I. A. Sokolov. *Stal',* v. 17, March 1957, p. 220-227.

When blowing compressed air into the openhearth bath, the oxidation of carbon in the metal takes place mainly due to the oxygen being heated to 1700° C. and absorbed by the bath from the furnace atmosphere. An essential thermal effect of the reaction is an improvement of the heat transmission from the flame to the bath, which is agitated vigorously by the air blown in, resulting in a sharp rise of the metal temperature and the rate of its superheating. 8 ref. (D11p, D2g; ST)

294-D. (Russian.) **Application of Calculating Machines to the Automatic Control of Blast Furnaces.** I. A. Rylov. *Stal',* v. 17, June 1957, p. 488-493.

In the complex control system of the blast furnace it appears expedient to use calculating machines intermittently, since they perform counting operations and other elementary functions. (D1, X14, 1-2)

295-D. (Russian.) **Automatic Loading and Weighing of the Blast Furnace Burden at the Charging Skips of the Belt Conveyer.** A. A. Ganich, V. F. Zarubin and V. G. Yakovlev. *Stal',* v. 17, June 1957, p. 496-500.

Operation of one blast furnace at Magnitogorsk indicates that the replacement of the scale-cars for loading and weighing by stationary weighing hoppers at the charging skip of the belt conveyer has increased the productivity of the charging equipment. There is also a reduction of metal used for the corresponding structures. (D1b, W12b, 1-2)

296-D. (Russian.) **Ball Bearing Steel Melting in the Acid Openhearth Furnace.** P. P. Semenenko, M. M. Golovanov and I. G. Fadeev. *Stal',* v. 17, June 1957, p. 503-507.

An improvement in the technical melting practice for ball bearing steel in the Serov acid openhearth furnace reduces the nonmetallic contamination; an approximation of electric furnace steel is obtained. (D2, 1-14; ST, SGA-c, 3-19)

297-D. (Russian.) **On the Nature of Killed Steel Ingots.** A. N. Lekontsev. *Stal',* v. 17, June 1957, p. 512-513.

Study of an experimental killed steel ingot weighing 1550 kg. Five conclusions given for obtaining improved weight and quality of an ingot of killed steel. 5 ref. (D general, ST-c, 5-9)

298-D. (Russian.) **Injection of Oxygen into the Gas Port of Openhearth Furnaces.** V. A. Makovskii and Ch. A. Okinchits. *Stal',* v. 17, June 1957, p. 513-516.

Tests designed to speed up the process using technical grade (85-93%) oxygen injected into the gas port. The mathematics involved; schematic and cross-sectional drawings of the injector. (D2g, W18g, 1-2)

299-D. (Russian.) **On the Question of Conversion of High-Phosphorus Iron in the Tilting Openhearth Furnace.** E. V. Tretyakov and V. A. Makovskii. *Stal',* v. 17, June 1957, p. 517-519.

Results of tests run on a 350-ton Talbot-process type furnace. 4 ref. (D2, 1-2, Fe, *P*, ST)

300-D. (Russian.) **New Method of Deoxidation and Desulfurization of Steel for Improvement of Quality.** V. A. Skachko and N. P. Merenkov. *Stal',* v. 17, June 1957, p. 521-522.

Experimental melts of steel are described giving a new method of deoxidation and desulphurization by means of aluminum. 8 ref. (D9r; ST, *Al*)

301-D. (Russian.) **Method of Making Flat Ingots.** I. D. Kuzema. *Stal',* v. 17, June 1957, p. 541-543.

New method of making flat ingots giving the mathematical use of coefficients depending on dimensions of the sheets required. Significant reduction in metal consumption per ton of the acceptable sheet is realized. (D9, F23, 5-9, 4-3)

302-D. (Russian.) **Influence of Technological Factors of Melting and Pouring on Fine Cracks in 1-2X13 Steel.** M. I. Vinograd, G. S. Chernyak and N. D. Orekhov. *Stal',* v. 17, June 1957, p. 560-562.

A considerable reduction in fine cracks is achieved by use of ingot heads from siphoned bottom-poured metal, when the temperature in the ladle after tapping is held to 1550 to 1650° F. (D9m; ST, 5-9, 9-22)

303-D. **Steelmaking Plans for Tomorrow.** P. M. Unterweiser. *Iron Age,* v. 180, Sept. 19, 1957, p. 139-144.

Recent developments in steelmaking including direct reduction processes, alkali desulphurization processes and continuous casting setups. (D general)

304-D. **Pouring of Steel Ingots With Electric Arc Heating of Their Heads.** B. N. Popov. *Metallurg,* v. 1, no. 9, 1956, p. 19-22. (*Henry Brutcher Translation* no. 4029.)

Design of industrial-scale equipment for arc heating of the tops of steel ingots with sonic-frequency a.c. Technique of arc heating; suitable ingot sizes. Comparison of primary pipe obtained when bottom pouring ingots without and with arc heating of their heads. (D9p, 1-2; ST)

305-D. (Czech.) **Artificial Blast Furnace Wind Wetting.** Miroslav Prouza. *Hutnické Listy,* v. 12, no. 2, 1957. p. 97-102.

Observations on effect of water vapor addition to blast furnace blast on material and thermal balances and oxidation reduction processes; amount of moisture added determined by stove capacity, climatic conditions and types of control equipment available. 4 ref. (D1b)

306-D. (Czech.) **Continuous Steel Casting in the USSR.** M. S. Bojcenko and V. S. Rutes. *Hutnické Listy,* v. 12, no. 6, 1957, p. 500-509.

Industrial units for continuous steel casting; details of pouring; steel casting equipment; drawing of semifinished product from ingot mold. (D9q, 1-2; ST)

307-D. (French.) **Use of Natural Gas in Reduction of Iron Ores.** J. Raffin. *Annales des Mines,* June 1957, p. 345-352.

Högonäs, Wiberg, Krupp-Renn processes of so-called "direct ore reduction"; physical chemistry of reduction by gases and use of natural gas; cracking of methane; hydrogen reduction, H-iron process, ONIA process; economic aspects of gas-producing materials in Western Europe; prospects for future development and use of processes covered. 7 ref. (D8j; Fe, RM-n)

308-D. (French.) **New Perspectives in Thomas Steel Production.** Marc Allard. *Société des Ingenieurs Civils de France, Memoires,* v. 110, May-June 1957, 194-199.

Recent improvements in Thomas process provide more accurate metallurgical control, hence better steels, thereby improving market position of plants using this process. (D3; ST)

E Foundry

489-E. Advancements in the Investment Casting Process. Kenneth Rose. *Automotive Industries,* v. 117, Aug. 15, 1957, p. 56-57, 117.

Casting of metals in a vacuum; use of special cores to make possible larger castings; use of ceramic shells for the molds to decrease the amount of material handled in the foundry and improve accuracy of the castings. (E15, 1-23)

490-E. Ultra-Light Iron Castings for the Motor Industry. T. Wolverson. *British Foundryman,* v. 50, Aug. 1957, p. 395-399.

Molding practices in casting of automobile piston rings; methods for attainment of desired microstructure, molding practice and casting of valve tappets. (E19, T21b, 17-7; CI)

491-E. Aspects of the Feeding of Castings. B. J. Templar. *British Foundryman,* v. 50, Aug. 1957, p. 406-407.

Study of freezing of gunmetal gives information on thickness of castings which can be fed by 2-in. diameter feeders surrounded by exothermic material, plaster, sand or other heat insulating material. (E22, E25n; Cu)

492-E. Improvised Methods of Shell Molding. T. H. Weaver. *British Foundryman,* v. 50, Aug. 1957, p. 421-428.

Factors to consider before changing to shell molding. The production of shell cores and molds using improvised methods and equipment. (E19c)

493-E. Composite Castings of Aluminum Bronze and Steel. C. H. Meigh and G. E. E. Marshall. *British Petroleum Equipment News,* v. 6, Summer 1957, p. 36-38.

Development of composite castings, made by casting aluminum bronze on a steel core, enables the physical properties of the aluminum bronze to be combined with the relatively low cost of steel in the manufacture of a wide range of components. Features of the production method. (E general; Cu-s, *Al,* ST, 7-9)

494-E. Metallurgical Developments in Light Metal Piston Alloys. M. G. Neu. *Canadian Metalworking,* v. 20, Aug. 1957, p. 60-66.

Refined grain structure in aluminum alloy containing 20% silicon for use in automobile pistons procured by inoculation of melt with organic compound containing phosphorus. (E25q, T21b, 17-7; Al)

495-E. Kaolinitic Clays. *Castings,* v. 3, July 1957, p. 27-29.

Tests proved that kaolinitic clay mixes and sands bonded with kaolinite/bentonite mixtures have better foundry "life" properties than mixes bonded with bentonites alone. (E18p)

496-E. New Processes Used at New Investment Casting Foundry. Edwin Bremer. *Foundry,* v. 85, Oct. 1957, p. 95-97.

Investment mixing and melting employed at the Misco Precision Casting Co. in the manufacture of high-alloy vanes for aircraft jet engines. (E15; SGA-h)

497-E. Lightening the Atomic Cannon. G. D. Chandley and J. L. Belser. *Foundry,* v. 85, Oct. 1957, p. 100-103.

Report on Ordnance Corps sponsored research at the Watertown Arsenal. Tests were made on a 700-lb. aluminum bolster casting for 280-mm. atomic cannon to replace 1350-lb. steel weldment currently used. 3 ref. (E general, T1m, 17-7; Al)

498-E. Molding With CO_2. Leonard Romano and Anton Dorfmueller, Jr. *Foundry,* v. 85, Oct. 1957, p. 104-107.

Gassing techniques; mold washes; advantages at a molding medium; problems in using CO_2 sand. (E19)

499-E. IBF Annual Conference. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 183-188.

Abstracts of papers and discussion presented at Conference of the Institute of British Foundrymen. Points mentioned include water cooling; hot blast and oxygen enrichment of cupolas; production of iron alloy castings; carbon dioxide core processes; metal losses in crucible melting practices; melting and casting aluminum bronze; mold drying. (E general)

500-E. New Light Foundry at K & L. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 191-194.

Layout of sand plant, mold and core shop, melting and knock-out facilities of a new British steel foundry. (E general, W10, 1-2; ST)

501-E. Mossend and Hamilton Foundries of the Fullwood Company, Ltd. *Foundry Trade Journal,* v. 103, Aug. 29, 1957, p. 253-257.

Layout of these two Scottish foundries and the various services and processes utilized for economical production. The capacity of the Mossend foundry, when ingot molds up to 50 tons individual weight are made, is well over 1,000 tons per week. (E general, 18-17; ST)

502-E. Application of Sodium Silicate for Bonding Sands. F. W. Nield and D. Epstein. *Foundry Trade Journal,* v. 103, Sept. 5, 1957, p. 279-284.

Four sodium silicates, of SiO_2: Na_2O ratios; 2.0, 2.5, 2.9 and 3.3, were investigated and evaluated as bonding agents for a silica sand. The sand was produced by passing CO_2 through cylindrical standard test pieces and the relationship between compression strength and gassing time was established. 4 ref. (E18n)

503-E. The Manufacture and Application of Large Aluminium Pressure Die Castings. A. F. Bauer. *Machinery,* v. 91, Aug. 30, 1957, p. 491-502.

Recent progress; examples of components made by the process; machines and dies used for the castings; design of large dies and the materials employed; the design of large components for pressure die casting and the testing of large castings. (E13; Al)

504-E. 1958? Technical Advances Lead to New Uses, Lower Costs. *Precision Metal Molding,* v. 15, Sept. 1957, p. 60-61, 127.

Brief comments on new alloys, improved die materials, cast dies (Shaw Process), color anodizing, vacuum die casting. (E13, W19n, 1-2)

505-E. Casting Vs. Brazing of Wave Guides. K. L. Herrick and S. Lipson. *Precision Metal Molding,* v. 15, Sept. 1957, p. 70-71.

Advantages of investment casting; patten dies; wax injection and assembly; investing; casting; cleaning and finishing. Casting showed excellent electrical functioning. (E15, K8)

506-E. Faster CO_2 Cores. D. C. Ekey and E. G. Vogel. *Steel,* v. 141, Sept. 2, 1957, p. 150-156.

Multicycle vacuum gasser uses less carbon dioxide and hardens cores faster than gassing by hand. (E21g)

507-E. (English.) **The Foundry Industry in Sweden.** Lars Villner. *Gjuteriet,* v. 47, Aug. 1957, p. 137-145.

History, location, present numbers, productivity and types. Sweden, in 1956, produced 350,000 metric tons of gray iron castings, 34,000 tons steel castings, 18,000 malleable iron, 13,000 tons copper and 6,000 of light metal castings; foundry associations and organizations. (E general, A2, A4, A12g)

508-E. (English.) **Foundry Industry in Denmark.** Ove Hoff. *Gjuteriet,* v. 47, Aug. 1957, p. 146-147.

Briefly considers history, type and extent of foundry industry; production figures for 1956. (E general, A2, A4)

509-E. (English.) **Foundry Industry in Finland.** O. E. Huhtamo. *Gjuteriet,* v. 47, Aug. 1957, p. 148-151.

Development, locations, importance in economy and estimated foundry output. (E general, A4)

510-E. (English.) **The Foundry Industry in Norway.** Torolf Krogvig. *Gjuteriet,* v. 47, Aug. 1957, p. 152-156.

Development and history, present status, productivity, annual production and associations and organizations of Norwegian foundry industry. (E general, A2, A4, A12g)

511-E. (English.) **Water-Soluble Cellulose Ethers as Binders for Foundry Purposes.** Rolf Moren. *Gjuteriet,* v. 47, Aug. 1957, p. 157-165.

Data are given on baked transverse strength, green compressive strength, shatter index, gas content, collapsibility, and other properties of sand cores and molds bonded with cellulose ethers in combination with synthetic or natural resins or with cellulose ethers replacing cereal binders in oil-sand; comparison of properties of different cellulose ethers. (E18n)

512-E. (English.) **A Cost Comparison for Molten Iron From Induction Furnaces and Cupolas.** Mats Rydinger and Bertil Lundberg. *Gjuteriet,* v. 47, Aug. 1957, p. 173-178.

An attempt has been made to evaluate the melting cost in high-frequency and mains-frequency induction furnaces on the basis of operational data from several foundries. A comparison has been made between high-frequency, mains-frequency, cold-blast cupola and hot-blast cupola melting plants of the same capacity. (E10, 1-2, 17-3; CI)

513-E. (French.) **Use of Self-Drying Binders.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 8, Suppl., July 1957, 2 p.

Notes on use of oil-base binders in particular include practical suggestions on condition and types of sand to be used, sand preparation, how to use self-drying sand, core baking, advantages and disadvantages in use of such binders. (E18n)

514-E. (German.) **Seventy-Five Years of Iron Foundry Practice.** Hans Reininger. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 305-315.

Historical review of European foundries; methods, equipment, raw materials and products; development of current practice. 10 ref. (E general, A2; CI)

515-E. (German.) **Automation in the Foundry.** A. Hohmann. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 316-318.

Necessity of automation; advantages in time, labor and economy; examples in different phases of foundry work. (E general, 18-24)

516-E. (German.) **Use of Scrap in Cast Iron.** Hans Nordmann. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 322-324.

Importance of the use of the right kind and quantity of scrap; as a general rule only scrap similar in character to material being cast can be used; too much scrap lowers quality. (E general; CI, RM-p)

517-E. (German.) **Segregation Phenomena in Solidification of Metal Alloys.** Rudolph R. Domanowski. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 335-344.

Description of different irregularities based on foundry experience; causes, how to avoid defects and to reduce the uneven concentration of the metal particles. 8 ref. (E25n, 9-19)

518-E. (Italian.) **Foundry Mechanization for Non-Mass-Produced Castings. Technical and Economic Limits.** Nicola Monniello. *Fonderia Italiana,* v. 6, July 1957, p. 285-292.

Step by step examination of equipment, procedures and processes shows that with proper organization considerable mechanization can be achieved even where mass production is not involved, and that such mechanization is economically desirable and necessary. (E general, 18-24)

519-E. (Italian.) **Theory and Practice of Inoculation of Cast Iron.** Alfredo Secciani. *Ingegneria Meccanica,* v. 6, May 1957, p. 48-52.

Theory is advanced, on basis of fundamental structure of cast irons, that graphite is formed by "scission" from cementite. Practical standards for inoculation are suggested. 6 ref. (E25q; CI)

520-E. (Japanese.) **Malleable Iron for Export.** *Metals,* v. 27, Aug. 1957, p. 627-629.

Manufacture of malleable iron for the piston rings at Kumaya factory in Japan; the piston rings are exported to North and South America and Southern Asia. (E11, T21b, 17-7; CI-s)

521-E. (Portuguese.) **Foundry Sands Bonded by Sodium Silicate and Carbon Dioxide.** Victor Lo Re. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 129-137.

Experiments were carried out to determine influence of humidity, length of mixing time, proportion of sodium silicate and duration of CO_2 injection on principal characteristics of test pieces. 7 ref. (E18n)

522-E. **Protection and Preparation of Casting Surfaces.** Van der Bruggen. *Foundry Trade Journal,* v. 103, Sept. 12, 1957, p. 315-318.

Nature and causes of surface contamination of remedial measures and various means of preventing initial corrosion. (E25, R general)

523-E. **Speaking of Investments.** H. J. Meerkamp van Embden. *Foundry Trade Journal,* v. 103, Sept. 19, 1957, p. 339-344.

Simple theories on the problems of the investing technique used to produce precision investment castings. Various methods including direct investment, the use of silica refractories and duplex treatments. (E15)

524-E. **Effects of Vacuum Melting on the Growth of Gray Cast Iron.** F. N. Tavadze and I. A. Bairamashvili. *Liteinoe Proizvodstvo,* no. 12, Dec. 1955, p. 23. (*Henry Brutcher Translation* no. 4038.)

Linear growth and scaling resistance of gray iron before vacuum melting or remelting, respectively, as function of time of holding at 730° C.; changes in microstructure after vacuum treatment. Evaluation of results with reference to the cause of the much smaller growth obtained after vacuum melting. (E25q, E10, 1-23; CI-n)

525-E. (French.) **Present Applications of the CO_2 Process.** Lev Petrzela. *Fonderie Belge,* Sept. 1957, p. 209-222.

Principle of chemical hardening of foundry sands; main types of chemically hardened materials; sand preparation; molding techniques, use of chemically hardened mixtures in steel, gray iron and malleable iron foundries; casting defects; regeneration of used sands, all with reference to Czechoslovakian practice. (E18)

526-E. (French.) **Characteristics of Core Sands.** Gabriel Joly. *Fonderie Belge,* Sept. 1957, p. 223-230.

Experimental study of sand characteristics, considered herein as most important factor in setting time for self-drying mixtures, led to two main conclusions: the higher the fineness index of sand, the greater the percentage of oil required; granulometric distribution and shape of grains are as important as fineness index in sand mixture. (E18p)

F Primary Mechanical Working

171-F. **Spray Lubricates Extrusion Dies Faster.** *Iron Age,* v. 180, Aug. 29, 1957, p. 70-71.

Spray lubrication of extrusion dies results in good finish on aluminum extrusions. (F24, 18-23)

172-F. **Developments in Aluminum Extrusion Techniques.** *Machinery,* v. 91, Aug. 30, 1957, p. 485-488.

Equipment recently installed in the light press plant of the Kaiser Aluminum & Chemical Corp. (F24, 1-2; Al)

173-F. **Extrusion of a Complex Shape Through a Round Die.** William E. Ray. *Metal Progress,* v. 72, Sept. 1957, p. 65-69.

A long, straight control rod of Y-shaped cross section for a nuclear reactor is made by canning flat cermet compacts, assembling them with appropriate inserts of soft steel to fill a sealed sheath, hot extruding the combination, and then dissolving the soft steel inserts in acid, leaving behind the required stainless-clad rod. (T11j, 17-7, F24; SS, Eu, 8-16)

174-F. (Russian.) **Roll Pass Design for Rails.** A. M. Karpunin. *Stal',* v. 17, June 1957, p. 536-540.

To raise the quality and increase the productivity it was found desirable to increase the vertical reduction of metal in the trapezoidal passes and to lower the collar of the first pass up to 20 mm. 9 ref. (F23; ST, 4-7, 17-1)

175-F. (Russian.) **Technical Improvement in the Process of Producing Thick Sheets of High-Chromium Steel.** A. A. Babakov, T. A. Zhadan, V. A. Danilin, S. F. Bakuma, K. I. Antipov, M. N. Kulkova, and S. Z. Kupriakhina. *Stal',* v. 77, June 1957, p. 555-559.

To improve the technology of the production of thick sheet steel X25T & X28 the authors developed a special regime in the rolling mill and heat treating plant. Fine-grained metal with increased plasticity and strength was made. (F23, J23; AY, *Cr,* 4-3)

176-F. (Czech.) **Influence of Rolling on the Resistance of Steel Sheet Against Fissure Formation During Pressing.** Bohuslav Otta and Josef Teindl. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 515-517.

Influence of rolling performed with one or two inter-stage anneals on fissure formation during pressing of thin steel sheets. Sheets rolled with two inter-stage anneals showed higher percentage defective pressings than those rolled with only one inter-stage. (F23, J23; ST, 4-3)

177-F. (French.) **Contribution to the Study of Rolling Equipment. Pt. I, concluded. Malleability and Flow of Metals During Hot Rolling.** G. Grenier. *Echo des Mines et de la Metallurgie,* no. 3505, June 1957, p. 343-344.

Importance of temperatures in rolling operations. (To be continued.) (F23, Q23q)

178-F. (Italian.) **Metal Forming by Hot Plastic Deformation. Pt. 5, continued.** R. Giusfredi. *Rivista di Meccanica,* no. 165, July 6, 1957, p. 43-45.

Cropping operations and equipment. (To be continued.) (F29, 1-2)

179-F. **Oscillating Shear Cuts Angles in Coil Stock.** F. T. P. Plimpton, Jr. *Iron Age,* v. 180, July 4, 1957, p. 78-79.

Automatic feeding, positioning and stacking are among features of shear for cutting steel sheet. (F29q, 1-2; ST, 4-3)

G Secondary Mechanical Working

Forming and Machining

381-G. **Cutting Analysis Cuts Costs.** William W. Gilbert. *Canadian Metalworking,* v. 20, Aug. 1957, p. 32-36.

Important variables in metal cutting analyzed in computer to achieve full utilization of machine tools in cutting stainless steel and other materials. (G17, S12; SS)

382-G. **Titanium Grinding.** L. C. Hays. *Grinding and Finishing,* v. 3, Sept. 1957, p. 39-44. (CMA)

The main reason for poor results from grinding titanium as steel is ground is the affinity of titanium for other elements. Typical jobs in grinding titanium aircraft parts are considered: belt polishing of jet blades with a sprayer to apply grinding fluid, internal grinding of holes in RC 130B alone or with stainless steel, and form grinding. (G18; SS)

383-G. **How to Make Oxygen Cutting Do More Jobs.** Carl Underwood. *Iron Age,* v. 180, Aug. 29, 1957, p. 63-66.

Suggestions and advantages in using oxy-acetylene for cutting steel; effect of preheating, alloy content, carbon content, jet design, oxygen flow and travel speed. (G22g; ST)

384-G. **Learning Metalwork With Aluminium—Pt. 26.** John C. Older. *Light Metals,* v. 20, Aug. 1957, p. 270-271.

Elementary instructions for spinning aluminum articles. (G13; Al)

385-G. Progress Report on Ceramics. Pt. 10. Production Turning With Ceramics. J. Kosinski, C. Hiera and E. Jablonski. *Metalworking Production,* v. 101, Aug. 16, 1957, p. 1413-1416.

Data on machine operation and results obtained using ceramic tools for turning steel bearing sleeves. (G17a; SGA-j, 6-20)

386-G. How to Abrasive Finish Cast Iron. Charles F. Walton. *Metalworking Production,* v. 101, Aug. 16, 1957, p. 1421-1423.

Recommended grit size and range for finishing gray iron castings by surface, disc, cylindrical, centerless and internal grinding. (G18; CI)

387-G. Belt Grinder Finishes Tapered Skins. Joseph R. Burns. *Metalworking Production,* v. 101, Aug. 16, 1957, p. 1430-1432.

Abrasive belt grinding machine grinds large flat and tapered surfaces on aluminum, magnesium and stainless steel sheets. (G18; Al, Mg, SS, 4-3)

388-G. Progress Report on Ceramics. Pt. 11. Ceramic Tools Last Longer on Camshafts. George H. De Groat. *Metalworking Production,* v. 101, Aug. 23, 1957, p. 1461-1464.

Carboloy 0-30 cemented-oxide tools used for finish-turning of high-alloy cast iron camshafts; tool geometry and a comparison of results with those obtained using carbide tools. (G17a, SGA-j, 6-20)

389-G. Die Casting Aluminum and Zinc. Pt. 3. *Modern Metals,* v. 13, Aug. 1957, p. 48-54.

Trimming, blanking, drilling, tapping, deburring, and burnishing operations on zinc and aluminum die castings. Plating and electroplating baths for zinc and aluminum castings. (G general, L10, L17; Al, Zn, 5-11)

390-G. Deburring Titanium. *Steel,* v. 141, Sept. 9, 1957, p. 121. (CMA)

North American has developed a device for deburring titanium strip. The strips are pulled through a series of cutting tools and radiused to produce a smooth rounded edge. Breakage in stretch forming has been reduced to 1%, and costs are otherwise reduced. (G19; Ti)

391-G. Spinning Keeps Pace With New Technology. *Steel,* v. 141, Sept. 2, 1957, p. 131-134.

Spinning methods; new development in automatic spinning and examples of aluminum, mild, alloy and stainless steel parts produced by spinning. (G13; Al, CN, AY, SS)

392-G. Cold Heading Copper for Economy. Theodore B. Smith. *Steel,* v. 141, Sept. 23, 1957, p. 133-137.

Advantages of this process include economy, elimination of scrap, increase in fatigue and shock resistance, improved surface finish and close dimensional tolerance. (G10, 1-17; Cu)

393-G. Mechanization Cuts Slab Grinding Cost. H. R. Kerber. *Steel,* v. 141, Sept. 2, 1957, p. 138-144.

Recommends speeds and grinding procedure for grinding chromium and chromium-nickel steel slabs to remove oxidized surface and defects with mechanical grinders. Wheels and grinding practice to insure satisfactory wheel life. (G18; SS)

394-G. The Fundamentals and Application of Form and Thread Rolling. A Cold Forging Technique. Pt. 1. Clifford T. Appleton. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 440-446.

Reviews thread rolling process; advantages of process include increased length, accuracy, uniformity, material savings, high production speed; thread rolling die and equipment; preferred forms for rolling. (To be continued.) (G12)

395-G. Electrolytic Grinding Tames Hard Metals. Lynn A. Williams. *Tool Engineer,* v. 39, Aug. 1957, p. 96-97.

Desirability of maximum area of contact in electrolytic grinding of tungsten carbide, high speed steel or special alloys.
(G24d, W, C, 6-19, TS-m)

396-G. Honing Speeds. *Tool Engineer,* v. 39, Aug. 1957, p. 117-122.

Recommends honing speed for hard and soft steel; cast iron, aluminum and bronze; data on relation between rotation speed, reciprocating speed, cross-hatch angle and helical speed.
(G19n; ST, Ci, Al, Cu-s)

397-G. This Thing Called Machinability. Pt. 1. W. A. Nordhoff. *Western Machinery and Steel World,* v. 48, Aug. 1957, p. 73-76.

Data on machinability as affected by quality and nature of cutting tools, depth of cut, feed rate, spindle speed and microstructure of materials such as mild and medium carbon steels, nickel steels, stainless, cast iron, malleable iron, nickel alloys, chromium, titanium, copper, aluminum or magnesium. (To be continued.) (G17k)

398-G. (Italian.) **Oxygen Cutting Equipment.** Oscar Grossi. *Macchine,* v. 12, Aug. 1957, p. 729-745.

Detailed review of all types of flame cutting equipment; accessories, applications, performance, gas consumption of each type.
(G22g, 1-2)

399-G. (Italian.) **Classification of Cutting Fluids by Means of Laboratory Tests.** F. di Mento, A. Palumbo and A. Testore. *Rivista di Meccanica,* no. 162, May 25, 1957, p. 19-27.

Cutting fluids defined as those used in operations in which chip is formed by action of a tool. Causes of heat generation in tool-part relationship; functions, characteristics, greasiness of cutting fluids; emulsifiable oils; typical machining operations and choice of fluids; testing on machine tools. (To be continued.)
(G17; NM-h)

400-G. Test Results on Forming Titanium Extrusion. I. J. Wilson. *American Machinist,* v. 101, Sept. 23, 1957, p. 121-123. (CMA)

Extrusions of Ti-6Al-4V and A-110AT were subjected to stretch-wrapping, double offset bending and bending to a specific angle to make comparisons with titanium sheet. Die marks on the extrusions greatly affect bending perpendicular to the marks. Oxide scale contributes to cracking unless removed.
(G6, G9; Ti, 4-8)

401-G. Special Techniques for Increasing Strength and Fatigue Life of Steel Stressed in Torsion. N. E. Hendrickson. *ASTM Bulletin,* no. 224, Sept. 1957, p. 40-43.

Shot peening and presetting make it possible for 40 lb. of steel in torsion bar springs, for track-type vehicles, to do a job which would otherwise require almost twice as much material. 4 ref.
(G23n, G23q; ST)

402-G. Sub-Zero Machining and Quenching. R. J. Delaney. *Machinery,* v. 91, Sept. 6, 1957, p. 548-551.

Results obtained in milling and machining chromium-molybdenum steel, stainless steel and titanium using subzero coolants and subzero quenching have shown reduced tool wear and increased dimensional stability. (G17, 1-17; AY, SS, Mo)

403-G. Experimental Investigation Into the Characteristics and Behavior of the Built-Up Nose When Machining Mild Steel With High Speed Steel Tools. W. B. Heginbotham. *Microtecnic,* v. 11, no. 3, 1957, p. 113-121.

Factors controlling transition from simple shear condition to the built-up nose condition, with conclusion that it is not possible to operate high-speed steel tools on mild steel without a built-up nose being created, since mechanical failure of tool occurs at rake angles greater than 45°. 5 ref. (G17; CN, TS-m)

404-G. (French.) **Machining of Metals by Electric Erosion.** W. Ullman. *Machine Moderne,* v. 51, Sept. 1957, p. 37-48.

The importance of electro-erosion in machining is increasing at the expense of classical processes. The electro-erosion processes can be classified as electro-sparking or electro arcing. In either of these processes, it is an electrical force, instead of a mechanical force, which removes the metal. The process is cheap and convenient. (G24a)

H Powder Metallurgy

74-H. (Italian.) **Production of Hollow Bodies by Means of Powder Metallurgy.** Salvatore Valente. *Ingegneria Meccanica,* v. 6, May 1957, p. 35-39.

Experiments designed to establish possibility of manufacture of hollow bodies by powder metallurgy and influence of use of a deformable core of, for example, lead, on the final quality of the part. Types of products that can be produced only by powder metallurgy, and those that can be produced by powder metal and traditional methods.
(H general, 6-22)

75-H. (Roumanian.) **Electrolytic Production of Copper Powders.** A. Calusaru. *Rivista de Chimie,* v. 8, May 1957, p. 369-375.

Experimental study: polarization, process of powder formation, optimum conditions for powder production, current efficiency, specific surface and volumetric weight of powders. 55 ref. (H10b; Cu)

76-H. Powder Metallurgy of Zirconium-Uranium Alloys. Herbert S. Kalish. *American Society for Metals, Transactions,* v. 50, Preprint no. 30, 1957, 31 p.

Uranium and zirconium powders were made by the hydride process. In the case of the alloys rich in zirconium, high density was readily obtained even sintered well below the melting point, whereas alloys in the range of 40% and more uranium required sintering very close to the melting point to obtain high density. It was found that the zirconium-uranium system was particularly amenable to powder metallurgy and homogeneous alloys were obtained in all compositions. 6 ref.
(H general; Zr, U)

J Heat Treatment

239-J. Continuous Strip Annealing Line Has Precise Temperature Control. *Blast Furnace and Steel Plant,* v. 45, Sept. 1957, p. 1024-1025.

Control system at the Steel Co. of Canada Ltd. uses a radiation pyrometer to rapidly detect the effect of load changes and reset individual zone controllers, thereby permitting temperature control within normal tolerances on a completely automatic basis. (J32, X9r, 1-2; ST, 4-3)

240-J. Salt-Bath Graphitization Applied to High-Sulphur Irons. Olivier Bader and Daniel Godot. *Foundry Trade Journal,* v. 103, Aug. 15, 1957, p. 195-197.

Experiments demonstrate advantages of using salt bath at 1050° C for graphitization followed by heating at 740° C. in controlled atmosphere oil-fired furnace for partial ferritization of high sulphur, white cast iron; graphitization and ferritization processes control tensile strength and elongation properties of iron. (J23b, J2j; CI-p)

241-J. Bright Heat Treating the Nonferrous Alloys. Clarence E. Peck. *Metal Progress,* v. 72, Sept. 1957, p. 70-75.

Atmospheres are specified for successful bright annealing of the principal nonferrous metals and their alloys, to avoid dezincification of brasses, and to protect properly powder metal compacts during sintering, or combination during furnace brazing. (J2k, J23a, H15q, K8; Eg-a38).

242-J. Relief of Residual Grinding Stresses by Annealing. H. R. Letner and A. B. Sauvageot. *Metal Progress,* v. 72, Sept. 1957, p. 79-82.

Momentary heating of the surface (no more than 90 sec, in a salt bath) at 650° F. will relieve 80% of the internal stresses left by grinding. If softening of more than 1 point on the Rockwell scale is prohibited, 90 sec. at 500 to 600° F. will remove about half the surface stresses.
(J1a, G18; TS)

243-J. Sulphidizing in Fused Salts. E. M. Morozova and F. R. Florensova. *Metal Progress,* v. 72, Sept. 1957, p. 182-184. (From *Stanki i Instrument,* v. 29, no. 5, 1956.)

Effect of the sulphidizing environment; penetration of the case; results of wear tests. (J2j; ST, S)

244-J Some Problems Involved in the Production of Aluminum Sheet in Intermediate Tempers. T. R. G. Williams and T. I. Jones. *Sheet Metal Industries,* v. 34, Sept. 1957, p. 643-648, 668.

Intermediate grades of strength between fully annealed and hard rolled sheet are designated ¼H, ½H and ¾H respectively. Two methods of producing intermediate tempers in alloys of the work hardening type are described. Temper rolling and temper annealing and a comparison between the two processes.
(J23; Al, 4-3)

245-J. Austempering Is Mechanized. R. S. McFall and C. A. McFadden. *Steel,* v. 141, Sept. 23, 1957, p. 125-156.

Automatic machine at IBM,

heats, quenches, washes and dries typewriter parts automatically.
(J26p; ST)

246-J. Ductile Iron: How Heat Treatment Upgrades. R. S. Zeno and C. D. Walker. *Steel,* v. 141, Sept. 16, 1957, p. 132-134.

Heat treatment if it is maintained may be able to save heats of 90-65-02 and 80-60-05 ductile iron which do not meet specifications as cast. Tensile and hardness properties of treated castings are tested.
(J general; CI-r)

247-J. Methods of Controlling Atmospheres in Furnaces. O. E. Cullen. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 458-461, 470-471.

Basic problems of furnace atmosphere control; correct sampling technique and maintenance of proper carbon potential, dew point or gas analysis for heat treating processes such as hardening, carburizing or carbon restoring in both batch and continuous type furnaces.
(J2k, X7g, 1-2)

248-J. Heat Treatment of Precipitation-Hardening Stainless Steels for Honeycomb Structures. Allen C. Gilbraith. *Tooling and Production,* v. 23, Sept. 1957, p. 73-80.

Heat treatment procedures for and structural changes occurring in annealing and precipitation hardening of Armco's 17-7 PH, 17-4 PH and Allegheny Ludlum's AM-350 stainless steels developed for use at ultra-thin gages in honeycomb structures for aircraft and missiles; data on physical and mechanical properties at room and elevated temperatures in different heat treated conditions.
J23, J27; SS, 7-9)

249-J. Aging Characteristics of Hastelloy B. R. E. Clausing, P. Patriarca and W. D. Manly. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2314, Aug. 12, 1957, 7 p.

Aging studies were made by measuring the increase in hardness of Hastelloy B as a function of time and temperature and by observing metallographically any structural changes which occurred. As a measure of the mechanical properties, tensile tests were made at both room temperature and elevated temperatures on the material after various aging treatments. (J27d, N7a; Ni)

250-J. (French.) **O.N.E.R.A. Process of Skin Annealing in a Gaseous Medium. Application to Bright Annealing of Steels and Refractory Alloys.** Ph. Galmiche. *Recherche Aeronautique,* no. 59, July-Aug. 1957, p. 27-32.

Description of process; results in terms of surface condition and structure of surface zones; behavior of treated metals in high-temperature combustion gases; mechanical and service tests. Oxidation problems hitherto encountered in heat treatment of refractory alloys and such steel items as gas turbine blades can frequently be eliminated by introduction of metal fluorides into atmosphere of heat treat container. 5 ref. (J23, J2k; ST, SGA-h)

251-J. (Japanese.) **Salts for Heat Treatment.** Togohisa Kakugawa. *Metals,* v. 27, Aug. 1957, p. 635-637.

Compositions and temperature ranges of various kinds of salts for heat treatment; salts for quenching, carburizing nitriding and for holding at temperature. (J2j; NM-a33)

252-J. (Spanish.) **Spectrographic Determination of the Hardenability of Steels.** A. Camunas and E. Asensi Alvarez-Arenas. *Real Sociedad Espanola de Fisica y Quimica, Anales, Serie B, Quimica,* v. 53 (B), May 1957, p. 353-360.

New technique reveals influence of transformation of metallic state on relative intensities of spectral lines. Hardenability curves charted for carbon and alloy steels were similar to those obtained by conventional metallographic methods (cross section and Jominy tests). 7 ref.
(J5, 1-4; ST)

253-J. X-Ray Study of the Sulphurizing of Steel. Yu. M. Vinogradov and V. D. Zelenova. *Zavodskaya Laboratoriya,* v. 23, no. 6, 1957, p. 697-698. (*Henry Brutcher Translation* no. 4032.)

Comparison of X-ray spectra of surface layers of specimens of 0.45% plain carbon steel sulphurized in nine different baths. Advantages of baths producing pure ferrous sulphide in surface layer as against baths giving a predominantly nitrided surface. (J28, M21f; CN, S)

254-J. (French.) **Heat Treatment of High-Quality Cast Irons.** Jean Gonin and Gérard de Smet. *Machine Moderne,* v. 51, Sept. 1957, p. 52-58.

Effect of heat treatment on mechanical, physical and chemical properties; hardening treatments with drastic quenching improve the mechanical properties of the jackets of diesel engines. Annealing and martempering treatments; classification of special cast irons by heat treatment and by chemical treatment.
(J general; CI)

K Assembling and Joining

434-K. The Production Man's Guide to Joining Welded Steel Tubing-Carbon-Alloy-Stainless. *American Machinist,* v. 101, Sept. 9, 1957, p. 149-164.

Picture-captions showing 116 different ways of joining one piece of welded steel to another tube and to other parts. Methods are divided into two basic classifications—welding and mechanical.
(K general; ST, AY, SS, 4-10)

435-K. Three Cantor Lectures. H. G. Taylor. *British Petroleum Equipment News,* v. 6, Summer 1957, p. 61-65.

Historical review of resistance welding; aircraft and jet engine applications. (K3, A2)

436-K. Arc Welding Pointers for High Operator Efficiency. John Deleff. *Canadian Metalworking,* v. 20, Aug. 1957, p. 38-43.

Basics of manual arc welding covers machine setting, electrode angle, arc length and speed of travel; causes of common weld faults. (K1)

437-K. What You Should Know About Zirconium. T. A. Dickinson. *Industry and Welding,* v. 30, Sept. 1957, p. 54-55. (CMA)

Properties of zirconium. Zirconium is most readily welded with spot or seam resistance equipment. In inert-arc welding the gas should shield both sides of the weld area. Clean materials are important in both techniques. Use of a filler depends on design. When filler is used, oxidation is minimized by flame-spraying the zirconium surface with a ceramic coating, which acts as a flux. (K1, K3; Zr)

438-K. Procedures for Brazing by Torch, Gas-Air Burner, and Salt Bath. Lester F. Spencer. *Tooling and Production,* v. 23, Sept. 1957, p. 85-90.

General procedures in brazing copper, aluminum or steel assemblies by torch, gas-air burner, dip or salt bath methods. 7 ref.
(K8; Cu, Al, ST)

439-K. Solder Bonding Aluminum to Uranium. H. W. Mishler, J. T. Niemann, R. P. Sopher and D. C. Martin. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-923, July 7, 1954, 27 p.

Study to determine if flat-plate fuel elements could be produced by solder bonding aluminum sheets to a uranium core. It was necessary to plate the uranium with chromium, iron, or nickel which served as a diffusion barrier. The solders used were lead, tin, zinc and their alloys. The best bonds were produced with aluminum plated with 0.5 mil of copper and nickel-plated uranium given a copper flash.
(K7, T11g; Al, U)

440-K. Research on Elevated Temperature Resistant Inorganic Polymer Structural Adhesives. Pt. 2. H. H. Levine. Quantum, Inc. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 121908, Nov. 1956, 30 p. $.75.

Inorganic materials other than ceramics as high-temperature, metal-to-metal adhesives; an inorganic adhesive stable at 800° F. with room-temperature shear strength of 285 psi was obtained from the ammeline-phosphorus pentoxide reaction product; titanium dioxide priming of the steel increased the bond strength from an original value of 65 psi.
(K12; NM-d34, 2-12)

441-K. Development of Metal-Bonding Adhesive With Improved Heat Resistance. J. M. Black and R. F. Blomquist. Forest Products Laboratory. (Wright Air Development Center), *U. S. Office of Technical Services,* PB, 121856, April 1957, 20 p. $.50.

Tests were conducted to improve the heat aging characteristics of an experimental phenol-epoxy resin tape adhesive (FPL-878) developed earlier by the laboratory. The tape form, supported by glass mat carrier, produced better bonding of sandwich material, but lacked the resistance to long-time heat aging at high temperatures shown by the liquid form.
(K12; NM-d34)

442-K. Soldering Aluminum. J. D. Dowd. *Welding Engineer,* v. 42, Sept. 1957, p. 43-50.

Compositions and melting ranges of soldered alloys for joining aluminum to itself or other metals; information on organic fluxes, fluoride containing salt fluxes, heating methods, flux residue removal and the corrosion resistance of soldered joints. (K7; Al, RM-q)

443-K. Metallurgy of the Welding of Certain Austenitic Heat and Corrosion-Resistant Alloys. Anthony H. Waterfield and R. P. Culbertson. *Welding Journal,* v. 36, Aug. 1957, p. 360s-365s.

Metallurgical properties of six corrosion resistant and heat resistant alloys of high alloy types with nickel, iron or cobalt base are considered in light of their effect on welding techniques. Briefly dis-

cusses alloy development and use. (K9n; SS, SGA-g, SGA-h)

444-K. Problems Associated With the Welding of T-1 Material. Perry C. Arnold. *Welding Journal,* v. 36, Aug. 1957, p. 373s-381s.

Problems encountered in field welding of spherical pressure vessels of T-1 steel with working stress of 32,000 psi., transverse cracking and other difficulties eliminated by rebaking of electrodes and mild preheat. (K9p, K1; ST, SGB-a)

445-K. Studies of Welding Arcs Using Various Atmospheres and Power Supplies. T. B. Hazlett and G. M. Gordon. *Welding Journal,* v. 36, Aug. 1957, p. 382s-386s.

Study of arc characteristics, bead shape, weld penetration, metal transfer mechanism using d-c generator or rectified a-c power supply for consumable electrode, gas-shielded welding of AISI 1020 rolled steel with mild steel welding wire. Surface beads made in atmospheres of carbon dioxide, helium, argon and argon plus 5% oxygen with straight and reversed polarities. 9 ref. (K1, W29a, 1-2)

446-K. Ni-Cr-B Brazing of a High-Temperature Alloy. George Aggen, Roger A. Long and Edward E. Reynolds. *Welding Journal,* v. 36, Aug. 1957, p. 366s-372s.

Brazing investigation conducted on sheet and bar specimens of A286, iron base precipitation hardening high temperature alloy; brazing performed with nickel-chromium-boron brazing alloy in continuous belt furnace under dry hydrogen atmosphere; joints evaluated by metallographic examination and mechanical tests. (K8; SGA-h)

447-K. Automatic Inert-Gas-Shielded Tungsten-Arc Welding of Aluminum Alloys. H. D. Mann and R. E. Purkhiser. *Welding Journal,* v. 36, Aug. 1957, p. 790-797.

Current density, gas flow, arc length and tungsten type were found to influence arc stability when using alternating current. Straight polarity half of the alternating current wave was rectified with auxiliary equipment into direct current signal to operate present automatic control system. (K1d, 18-24; Al)

448-K. (German.) **Influence of Chemical Composition and Structure of Iron and Steel on Behavior Toward Hydrogen. Pt. I.** Friedrich Erdmann-Jesnitzer and Hans Sabath. *Archiv für das Eisenhuttenwesen,* v. 28, May-June 1957, p. 345-353.

The laws for transfer of hydrogen from arc atmosphere into the weld. The quantity of diffusible hydrogen is determined for various electrodes of basic-line and cellulosic types; different silicon content and different conditions for preparation of specimens. Silicon is found to favor hydrogen absorption and impede the release of hydrogen of alpha-iron at room temperatures. 54 ref. (K9n, N15d, 2-10; ST, *H*)

449-K. (German.) **Progress in Welding of Austenitic Steels in the Construction of Apparatus and Containers.** J. Mundt. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 29-36.

Some problems in the production of ductile welds in austenitic materials. Detailed procedures are for a welded joint of identical materials for low temperatures; a welded joint on plated material; a facing weld on alloy boiler sheet. A table gives the basic welding procedures for new materials and designs. (K general; AY, SS)

450-K. (German.) **Some Factors Influencing the Quality of Welds.** H. Sachs. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 37-46.

Heating conditions, form of specimens, hydrogen content, different types of electrodes, different length of time between passes were taken as variables, and their influence on tensile strength, strain and reduction of area was investigated. These effects may be superimposed on the varying effects of diameter of electrodes, amperage, contraction stresses and welding position. 7 ref. (K9n, K1)

451-K. (German.) **Welded Steel Tubes for Mining Shaft Construction.** W. Stroh and W. Stein. *Technische Mitteilungen Krupp,* v. 15, June 1957, p. 47-56.

Former cast tube segments can be replaced by welded and bolted steel tube segments. Special welding procedures and fixtures were developed. Forged ribs welded to the back of tubes serve as anchors in the cement filling. 27 ref. (K general, T28m, 17-7; ST)

452-K. (Japanese.) **Selection of Welding Methods and Welding Machines.** Iwao Onishi. *Metals,* v. 27, Aug. 1957, p. 601-602.

Simple illustrations of submerged arc welding, fused arc welding and tungsten inert-gas arc welding. (K1, 1-2)

453-K. (Japanese.) **Application of Automatic Arc Welding.** Takagi and Suzuki. *Metals,* v. 27, Aug. 1957, p. 617-620.

Automatic submerged-arc welding and automatic inert-arc welding in shipbuilding. (K1d, K1e, 18-24, T22)

454-K. (Norwegian.) **Trends in the Metallurgy of Arc Welding.** N. Christensen. *Teknisk Ukeblad,* v. 104, Feb. 28, 1957, p. 161-168.

Chemical and metallurgical factors in arc welding; temperature conditions; mutual reaction of bath and gas phase. Removal of hydrogen; hydrogen and temper fractures; hydrogen damage in mild steel welds. (K1, K9n; ST)

455-K. Welding of Zircaloy-2. J. G. Purchas, D. R. Harries and H. Cobb. *British Welding Journal,* v. 4, Sept. 1957, p. 412-421. (CMA)

Zircaloy-2 clad fuel elements may be arc welded successfully by using a chamber of inert gas. The welding sequence for the fuel elements is described. Welding current was 30-45 amp., depending on fusion conditions. The welds have good corrosion resistance in hot water under pressure. 8 ref. (K1d; Zr)

456-K. Welds Ti Parts in Portable Bubble. *Iron Age,* v. 180, Sept. 26, 1957, p. 142-144. (CMA)

United Aircraft uses plastic bubbles by Pioneer Valley Plastics Co. (Chicago) in welding titanium parts at its East Hartford plant. The cast vinyl plastic holds an argon atmosphere and is about 4 ft. x 4 ft. (K1d; Ti)

457-K. Electrode Quality Depends on Coating. Harry F. Reid, Jr. *Steel,* v. 141, Sept. 30, 1957, p. 83-84.

Use of different purifiers and alloying elements in electrode coatings gives versatility in properties of arc weld deposits. (K1, W29h)

458-K. Experimental Determination of Bonding Temperature. Gregory Blanc and R. D. Wasserman. *Welding Journal,* v. 36, Sept. 1957, p. 419s-422s.

Temperature measurements on three filler alloys for brazing were made with Ni/Cr-Ni thermocouple calibrated by the usual fixed points up to a temperature of 1650° F. Test methods and equipment. (K8, X9q; SGA-f)

459-K. Spot Welding 65-35 Brass on Single-Phase Equipment With Slope Control. L. E. Mills and H. C. Wolfe. *Welding Journal,* v. 36, Sept. 1957, p. 423s-428s.

Requirements for spot welding one-half hard yellow brass from the point of view of equipment, cleaning prior to welding, electrode material, welding time, electrode force, welding current, contact overlap and spot spacings. (K3n, 1-2; Cu-n)

460-K. Inert-Gas Tungsten-Arc Spot Welding of an Automotive Transmission Subassembly. W. G. Mertens and O. J. Ryder. *Welding Journal* v. 36, Sept. 1957, p. 871-876.

Application of this process effects a multiple number of spot welds of uniform high quality and low cost. (K3n)

461-K. Boiler-Code Welding and Joint Design With the CO_2 Process. J. D. Carey, Jr. *Welding Journal,* v. 36, Sept. 1956, p. 877-880.

Evaluation of the weldability of unfired-pressure-vessel components using the carbon dioxide process. Tests were made on the welding of two grades of boiler-code steel; ASME type A285 grade C and type A212 grade B. Enumerates optimum joint preparation and welding techniques. (K9s, K9r; ST)

462-K. Welding Problems in Pressure Vessels for Nuclear Reactors. R. E. Lorentz, Jr. *Welding Journal,* v. 36, Sept. 1957, p. 881-887.

Types of equipment, materials of reactor vessels and required properties. Data on impact properties of manual metal-arc and multilayer submerged arc deposited metal; and on manual metal-arc and submerged-arc stainless-steel cladding methods. (K general, W11p)

463-K. Consumable-Electrode Inert-Gas Welding With Small-Diameter Wires. K. E. Richter and J. F. M. Essig. *Welding Journal,* v. 36, Sept. 1957, p. 893-899.

Metal transfer requirements; wire deposition rates and wire-feed speeds; constant potential and conventional-type power supplies; manual and mechanized welding techniques. Relates to thin-gage stainless and carbon steels. (K1d, 1-2; SS, CN)

464-K. (French.) **Welding in Argon Atmosphere With a Consumable Electrode.** A. Baron. *Revue Générale de Mécanique,* v. 11, July-Aug. 1957, p. 302-306.

Process patented by Société l'Air Liquide utilizes continuous consumable electrode in neutral argon atmosphere. (K1d)

465-K. (French.) **Use of Welding in Gas Works.** R. Groffier. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 205-221.

Development of oxy-acetylene welding, and subsequently arc welding, in maintenance and repair of

gas works; welding in construction of storage tanks, coke plant equipment, feeders; description of hydraulic, dry and pressure-type feeders, design and fabrication of their welded components.
(K1, K2, T26n)

466-K. (French.) **Welding in Civil Engineering Equipment. Pt. I.** M. Dumas. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 223-229.

Examples of welded equipment such as traveling and other types of cranes, mechanical shovels, scrapers, steam rollers; advantages obtained by welding in construction of equipment. (K general, T4)

467-K. (French.) **Welding in Civil Engineering Equipment. Pt. 2. Applications in the Construction of Site Cranes.** L. Weitz. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 231-240.

Techniques and factors involved in welded crane construction; use of positioners and fixtures in assembly of prefabricated components; costs of welded construction compared with riveted. (K general, T4, W12q)

468-K. (French.) **Welding in the Construction of New Hall on Paris Exhibition Grounds.** R. Delesques. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 241-246.

A hall, 68 m. wide, 144 m. long, 26 m. high, supported by 200-ton steel framework consisting essentially of nine 30-m. high by 67-m. span portal frames, of all-welded construction, connected by bent and welded plate transoms. Site joints only were riveted. Welding program and details of erection at site.
(K general, T26n; ST)

469-K. (French.) **Bonding Mechanism in Braze Welding.** H. Granjon. *Soudage et Techniques Connexes,* v. 11, July-Aug. 1957, p. 247-254.

Experimental study of molten metal-base metal bonding in braze welding of ferrous metals using silicon brass as filler. Weld metal was eliminated, without corrosive effect on base metal, by dissolution in nitric acid. Micrographic study was then made of molten-metal base metal contact plane to determine structural effects of diffusion during braze welding. It was found that bonding is effected by a two-fold process, infiltration of ferrite grain boundaries and diffusion into austenite. Diffusion is accompanied by decrease in apparent carbon content. 7 ref. (K6q)

Cleaning, Coating and Finishing

537-L. Vitreous Enamelling on Steel and Cast Iron. J. W. G. Pedder. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 37-40.

Enamel composition and surface preparation for applying enamel to steel and cast iron; uses of enamel products in industry, household goods and construction materials.
(L27; ST, CI, 17-7)

538-L. The Protection of Threaded Parts by Electroplating. E. A. Ollard. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 41-47.

Control problems and the methods used for electroplating steel and brass screws with zinc, cadmium, tin or nickel and chromium.
(L17, T7f, 17-7; ST, Cu-n, *Zn, Cd, Sn, ni, Cr*)

539-L. Hot Dip Galvanizing. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 44-46.

Galvanizing process; protective action of zinc on steel; characteristics of galvanized coating and application of galvanized products.
(L16; ST, *Zn*)

540-L. Corrosion Prevention by Cadimum Plating. P. F. Norrish. *Corrosion Prevention and Control,* v. 4, Aug. 1957, p. 51-53.

Protective action of cadmium coatings on steel, comparison of cadmium and zinc coatings; electroplating process and uses of cadmium-plated products. (L17; ST, *Cd*)

541-L. New U. S. Plating Thickness Testers. *Electroplating and Metal Finishing,* v. 10, Aug. 1957, p. 249-250.

Instruments for gaging plating thickness include dermitron, measuring magnitude of eddy currents; phase angle thickness gage, depending on phase differences; and wave guide plating quality indicator, measuring conductance of coating.
(L17c, S14, 1-2)

542-L. Electrodeposition of Chromium-Molybdenum Alloys. S. C. Shome. *Indian Chemical Society, Journal,* v. 34, May 1957, p. 399-403. (CMA)

Chromium-rich alloys of molybdenum have been plated from solutions prepared by dissolving molybdic acid in the standard chromium plating solution. The dull deposits become bright on polishing. The highest amount of molybdenum achieved was 1.7%. Plating compositions, temperatures and current density conditions are tabulated.
(L17; *Cr, Mo*)

543-L. Selecting Mechanical Finishes for Aluminum. R. V. Vanden Berg. *Materials in Design Engineering,* v. 46, Aug. 1957, p. 102-106.

Types of surface obtainable by mechanical finishes; methods of finishing, advantages and limitations. (L10; Al)

544-L. Selecting Mechanical Finishes for Stainless Steel. Richard E. Paret. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 110-114.

Types of mill finish, methods of obtaining, surface appearance, applications; recommended operations for obtaining finishes equivalent to high mill polishes. (L10; SS)

545-L. Conversion Coatings for Metals. Robert J. Fabian. *Materials in Design Engineering,* v. 46, Aug. 1957, p. 121-136.

Phosphate, chromate, anodic, oxide and other coatings; metals that can be coated and types of coating produced; use of coating as decoration, aid to cold forming or improvement in paint bonding, corrosion or wear resistance. (L14)

546-L. Electroplating on Titanium Alloys. Leo Missel. *Metal Finishing,* v. 55, Sept. 1957, p. 46-54. (CMA)

Adherent electrodeposits of chromium, comparable to those on steel, were obtained on Ti-4Al-4Mn, Ti-6Al-4V and Ti-5Cr-3Al. Activation treatments for different alloys vary, most involving immersion in an HNO_3-HF mixture. Steel ball indentation tests of the electrodeposits were conducted. (L17; Ti, *Cr*)

547-L. Density and Porosity of Anodic Coatings on Aluminum. Ralph B. Mason. *Metal Finishing,* v. 55, Aug. 1957, p. 55-57.

Real density and percentage porosity of unsealed and water-sealed anodic coatings on 1100-H16 aluminum determined by weighing in toluene; variation in density and porosity with anodizing time, electrolyte and temperature. 15 ref.
(L19, P10a, P10m; Al)

548-L. Barrel Finishing. Arthur S. Kohler. *Metal Finishing,* v. 55, Aug. 1957, p. 58-64.

Barrel finishing principles and action taking place during barreling; definitions of words connected with barrel finishing; work classification and types of barrels including barrels of closed horizontal type submerged multi-compartmental barrels, fixtured barrels, oblique and other types. (To be continued.)
(L10d, 1-2)

549-L. Application of Ultrasonics in the Electroplating Industry. T. J. Bulat. *Metal Finishing,* v. 55, Aug. 1957, p. 65-67.

Production of ultrasonic vibration and application to the activation of bath in electroplating processes; utilization of ultrasonic cleaning prior to plating. (L17, 1-24, L10f)

550-L. Some Problems in the Finishing of Zinc-Alloy Die-Castings. J. Edwards. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 311-316.

Literature review covers defects and common difficulties encountered in plating zinc alloy die castings, such as process blistering, service blistering and methods of insuring acceptable plating. Properties of electrodeposits and methods in measurement and control of coating thickness; alternative methods of finishing zinc die castings. 32 ref.
(L17; Zn, 5-11; 10-4)

551-L. An Examination of Concentration Differences in Lead-Fluoborate Plating Baths. Gunnar Gabrielson. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 335-337.

Experimental determination of differences in concentration with level in lead fluoborate plating bath. 7 ref. (L17a)

552-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 9, 1957, p. 109-111.

Effect of glycerol, ethylene glycol or triethanolamine additions to electrolyte on the thickness and abrasion resistance of coatings produced in sulphuric acid electrolyte with constant power input; properties of coatings produced by electrolytes composed of various mixtures of sulphuric and oxalic acids. (To be continued.) (L19; Al)

553-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 23, 1957, p. 148-150.

Porosity of anodic films produced on Hiduminium 33 and 44 in oxalic, malonic, sulphuric or mixed acid; measured by rate of transpiration of vapor through film and by absorption of organic matter by film. (To be continued.) (L19; Al)

554-L. Thick Oxide Films on Aluminium Alloys. J. M. Kape. *Metal Industry,* v. 91, Aug. 30, 1957, p. 171-172.

Measurement was made of the indication of porosity change by the rate of change of voltage during anodic treatment. The higher the current density during anodizing the more compact the film produced. (To be continued.) (L19; Al)

555-L. Operating Experiences With Chromic Acid Recovery Equipment. Clifford L. Gough and Charles G. Bueltman. *Plating,* v. 44, Aug. 1957, p. 879-883.

Problems and experiences with ion exchange units for the recovery of chromic acid from rinse water. (L17, A11d; *Cr*)

556-L. Mechanized Finishing. *Precision Metal Molding,* v. 15, Sept. 1957, p. 75-91.

Finishing techniques applied to die castings; automatic spray painting; automatic buffing and polishing; automatic cleaning and plating; automatic barrel finishing. Equipment employed in each process is described. (L general, 1-2, 18-24; 5-11)

557-L. Titanium-Clad Steel Sooner Than You Think. R. F. Domagala, D. W. Levinson and W. Rostoker. *Product Engineering,* v. 28, Sept. 16, 1957, p. 111-113. (CMA)

Roll-cladding titanium to steel is a low-cost way to exploit titanium's corrosion resistance when embrittling intermetallic compounds, such as result from direct roll cladding, are obviated. By interleaving a layer of vanadium and copper between the steel and titanium, embrittling is prevented, sound bonding occurs and severe bending is possible. (L22; ST, *Ti*)

558-L. Coating Beats Heat. Paul A. Huppert. *Steel,* v. 141, Sept. 16, 1957, p. 135-136.

New ceramic insulates aluminum and prevents aluminum and its alloys from melting up to 1800° F. Coating also protects steels aluminized by hot dip or spray. (L27; Al)

559-L. New Ways to Fight Corrosion. Pt. 2. *Steel,* v. 141, Sept. 2, 1957, p. 158-160.

Organic coatings and their features in protecting steel and other metals from corrosion; zinc, aluminum and chromized coatings for steel protection. (L26, L15)

560-L. Preparation of Protective Coatings by Electrophoretic Methods. A. C. Werner, Vitro Corporation of America. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 131062, Apr. 1957, 53 p. $1.50.

Electrophoretic methods were tested for the preparation of protective coatings which would make molybdenum suitable for continuous, long-term operation in an oxidizing atmosphere at 1800 to 2000° F. Multilayer coatings of 80% nickel, 20% chromium and nickel-bonded chromium carbide provided good static air-oxidation resistance. (L29p; Mo, *Cr,* Ni, SGA-h)

561-L. Research and Development on Electrodeposition of New Chromium and Chromium-Alloy Plate. L. D. McGraw, Battelle Memorial Institute. (Bureau of Aeronautics), *U. S. Office of Technical Services,* PB 111911, Dec. 1952, 82 p. $2.25.

Chromium-iron alloy plating bath which produces hard, bright chromium-iron plate with abrasion resistance and a crack system very similar to conventional chromium plate; improvement in the process for plating mat-type chromium-iron alloys. The only deterrent to commercial use is the problem of adhesion of the alloy plate to steel. (L17; *Cr*)

562-L. (English.) **Chemical Polishing of Titanium Alloys.** Shigetake Okamoto. *Government Mechanical Laboratory, Journal,* v. 3, no. 1, 1957, p. 59-60. (CMA) (Also in *Journal of Mechanical Laboratory,* v. 11, May 1957, p. 84-86—Japanese.)

A study of the chemical polishing of titanium alloys in H_2SO_4 shows that best results are obtained when the acid is boiling, the concentration is 80-90% and the polishing time is 10-30 min. The alloys applicable are Ti-Cr-Mo, Ti-Ni, Ti-Cr, Ti-Ag, Ti-Mn, Ti-Fe, Ti-Mo, Ti-Cu, Ti-Co and Ti-Mo-Al. (L12g; Ti)

563-L. (French.) **Shot for Sand Removal. Cost of Use.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 88, July 1957, p. 15-17.

Economics of consumption as influenced by wearing out and loss of shot; how to reduce shot losses. (L10c, E24)

564-L. (Japanese.) **Examples of Hard Facing by Welding.** Shigeichi Maekawa, Taki and Izumi Hasegawa. *Metals,* v. 27, Aug. 1957, p. 614-616.

Characteristics of hard facing by welding; examples of hard facing on wheels and measurements of its wearing properties. (L24, Q9)

565-L. (Japanese.) **Plating of Bumpers.** Matsumoto. *Metals,* v. 27, Aug. 1957, p. 645-649.

Comparison of plating systems for car bumpers in United States and Japan. (L17, T21c)

566-L. (Portuguese.) **Zinc Plating of Steel Wire.** Eduardo Pyles Lozano and Gelio M. Gozzo. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 165-170.

Description of former primitive electroplating installation in plant of Mineracao Geral do Brasil Ltda. and improvements made in construction of new plating line. (L17, 1-2; ST, *Zn,* 4-11)

567-L. Sprayed Molybdenum and Its Applications. Sheila M. Wright. *Alloy Metal Review,* v. 8, Sept. 1957, p. 2-8.

Properties of coatings, spraying techniques and applications. 6 ref. (L23; Mo)

568-L. Learning Metalworking With Aluminium. Pt. 27. John C. Older. *Light Metals,* v. 20, Sept. 1957, p. 286-287.

Elementary instructions for etching designs on aluminum. (L12g; Al)

569-L. Gyrofinishing. *Metal Finishing Journal,* v. 3, Sept. 1957, p. 360-362.

Gyrofinishing, a new process suitable for buffing and polishing zinc alloy, aluminum, brass or stainless steel parts immerses fixtured parts into rapidly rotating abrasive medium. (L10d; Zn, Al, Cu, SS)

570-L. Stress-Free Nickel Plate. Edward Calderon. *Metal Finishing Journal,* v. 3, Sept. 1957, p. 373-374.

Experiences in plating nickel on stainless steel, Inconel-X and alloy A286 with sulphamate electrolyte; high-purity, ductile, stress-free nickel deposits obtained. (L17; SS, Ni)

571-L. Surface Treatment and Finishing of Light Metals. S. Wernick and R. Pinner. *Organic Finishing,* v. 18, Aug. 1957, p. 15-23, 27.

Surface preparation and mechanism of corrosion prevention by paint. Protective values, adhesion, formulation and characteristic of different primer and top coat systems for aluminum under marine, rural or industrial conditions. 16 ref. (L26n; Al)

572-L. (Czech.) **Possibilities of Improving Life of Steel Rolls by Hand-Operated Weld Surfacing.** Milan Zidek. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 110-116.

Abrasion resistance of rolls increased by manual weld surfacing of rolls with 18-8 chromium nickel austenitic steel; increasing carbon content and cold working of weld resulted in greater resistance to abrasion. (L24, W23k, 17-7; ST, *SS*)

Metallography

Constitution and Primary Structures

328-M. Crystal Structure of $PuAl_3$. Allen C. Larson, Don T. Cromer and C. K. Stambaugh. *Acta Crystallographica,* v. 10, July 1957, p. 443-446.

The crystal structure of $PuAl_3$ has been determined by single-crystal methods. The structure is hexagonal with $a = 6.10 \pm 0.02$, $c = 14.47 \pm 0.04$ A,Z = 6 units of $PuAl_3$ per unit cell, and most probable space group $P6_3/mmc$. 6 ref. (M26q; Pu, Al)

329-M. X-Ray Diffraction From Body-Centred Cubic Crystals Containing Stacking Faults. P. B. Hirsch and H. M. Otte. *Acta Crystallographica,* v. 10, July 1957, p. 447-453.

Calculations of the intensities diffracted from polycrystalline specimens of body-centered cubic crystals containing stacking faults on (211) planes. Possible applications of the theory to the anomalous line broadening from martensite and from cold-worked iron. 21 ref. (M22g, M26s; ST, Fe)

330-M. Some Data About the System Cerium-Thorium. J. H. N. van Nught. *Philips Research Reports,* v. 12, Aug. 1957, p. 351-354. (CMA)

Metallographic and X-ray diffraction studies of the system cerium-thorium show complete mutual solid solubility in the fcc phase; molybdenum intermetallic compounds are found. The deviation from Vegard's law as to lattice parameters is explained on the basis of strong binding forces compressing the radius of the cerium atoms. 5 ref. (M24b; Ce, Th)

331-M. Investigation of the System Zirconium-Tantalum. V. S. Emelyanov, Y. G. Godin and A. I. Evstyukhin. *Soviet Journal of Atomic Energy,* v. 2, no. 1, 1957, p. 43-49. (CMA) (Translated by Consultants Bureau, Inc.)

Metallographic, X-ray, thermal and electrical resistance methods were used in the study of the Zr-Ta system. The eutectic type phase diagram shows limited solubility: 0.22 at. % Ta in α-Zr at 790° C.; 16 at. % Ta in β-Zr at 1585° C.; and 17 at. % Zr in tantalum at 1585° C. A eutectic occurs at 1585° C. and 34 at. % Ta. A eutectoid alloy forms at 790° C. and 7 at. % Ta. The hardness of Zr-Ta alloys increases with the tantalum content. 9 ref. (M24b; Zr, Ta)

332-M. The Metallographic View. Pt. 37. High Speed Steels for Special Purposes. Howard E. Boyer. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 437, 463, 464.

Metallographs showing carbide distribution, following heating and tempering in AISI Type M-6 cobalt-bearing steel with high red hardness, and AISI Type T-3 steel containing 18% tungsten, 4% chromium and 3% vanadium with abrasion resistance properties. (M27d; TS-m)

333-M. (Czech.) **New Theories on the Structure of Carbo-Nitrided Layers.** Bohumil Prenosil. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 597-604.

Study of carbo-nitrided layers containing more than 0.5% nitrogen indicated a current of micropore bands on certain austenitic grain boundaries; separation of molecular nitrogen from atomic nitrogen solid solution in austenite is thought to cause microscopic pore formation. (M27, J28m; ST)

334-M. (Czech.) **Quantitative Phase Analysis of Kovar Alloys by X-Ray Diffraction Methods.** Alexander Spirkov. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 609-614.

Use of volumetric method elaborated by Fletcher and Cohen for steel alloys; when used for Kovar alloys, the values of G alpha and G gamma determined experimentally by dependence on temperature function. (M22g; Fe, Ni, Co)

335-M. (Czech.) **Direct Stabilization of X-Ray Radiation.** Frantisek Khol. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 614-617.

Direct method for stabilization of characteristic X-ray radiation for structure examination; the fluctuation of characteristic radiation intensity was less than ½% during 8 hr. exposure time. Methods consist of mechanical control of heating circuit and electrical control by means of transducer. (M22g, 1-3)

336-M. (French.) **Images of Stressed Metal Samples Obtained by Photo-Emission Microscope.** R. Bernard, G. Guilland and R. Goutte. *Journal de Physique et le Radium,* v. 18, May 1957, p. 327-330.

Study of whether phenomenon of about 10% excitation of electronic emission provoked by electronic bombardment or ultra-violet light on metal samples subjected to tensile stress is localized at certain points of surface. Experimental apparatus, preliminary results with crude gold, recrystallized gold. Minute examination of photographs showed that certain increased brilliance observed on images cannot be easily explained by topography of specimen. It is more probable that increased brilliances correspond to increase in photoemissive power of zone of specimen where mechanical stress reaches maximum value. 4 ref. (M21e)

337-M. (French.) **Diffraction Chamber for X-Ray Analysis of Chromium.** F. Sebilleau. *Recherche Aeronautique,* no. 59, July-Aug. 1957, p. 33-37.

Reflection-type diffraction chamber intended particularly for study of steels and other materials containing chromium and cobalt. Optic principles and instrumental causes of spreading of diffraction rays; examples of application show, in particular case of the X-radiation used, value of methods based on reflection as compared to those based on transmission. (M22g; ST, *Cr, Co*)

338-M. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 6. Austenitic and Ferritic Steels After Long Creep Tests.** Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 305-310.

Microscopic and X-ray examination of specimens after electrolytic isolation of carbides. (M27d, M26r, Q3; SGA-h, AY)

339-M. (German.) **On the System Bismuth-Copper-Magnesium.** Raymund Dobbener. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 413-417.

The phase diagram of bismuth-copper-magnesium is developed from thermal and microscopic observations. The diagram is similar to that of the system antimony-copper-magnesium. Magnesium has a higher affinity to bismuth than to copper. 7 ref. (M24c; Bi, Cu, Mg)

340-M. (German.) **Equilibrium Conditions in the System Copper-Beryllium-Aluminum.** Otto Nickel. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 417-424.

The equilibrium conditions of ternary copper-beryllium-aluminum alloys are investigated up to 26% Be and 18% Al. In this part of the system solidification extends over two four-phase reactions. A critical point in the range of solidification is observed. 20 ref. (M24c; Cu, Be, Al)

341-M. (Portuguese.) **Note on Possible Modes of Twinning in Body-Centered Tetragonal Martensite Crystals.** Michiyasu Doi. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 139-145.

Since recent studies do not confirm hypothesis that same type of twinning occurs in all martensite transformations of iron-base alloys, possibility is suggested, on basis of Mallard's law of a {101}, <101> type of twinning. 8 ref. (M27e, N8p; Fe)

342-M. (Portuguese.) **Study of the Microstructure of Cast Aluminum-Copper Alloys.** Isaac Berezin. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, Apr. 1957, p. 147-163.

Types of Al-Cu alloys for industrial use; equilibrium diagram of Al-Cu system; structure of six specimens containing from 4.5% to 45% copper. 11 ref. (M27d, M24b; Al, Cu)

343-M. **A Method for the Etching of Metals by Gas Ion Bombardment.** J. B. Newkirk and W. G. Martin. *American Society for Metals, Transactions,* v. 50, Preprint No. 8, 1957, 13 p.

An improved method for the etching of metal surfaces by bombardment with gas ions. Novel features, including the use of krypton as the etching agent and the application of a magnetic field in the ionization chamber, have made it possible to etch metallographic specimens more rapidly and with less heating of the specimen than has been reported heretofore. 3 ref. (M20r)

344-M. **Occurrence of Laves-Type Phase Among Transition Elements.** R. P. Elliott and W. Rostoker. *American Society for Metals, Transactions,* v. 50, Preprint No. 22, 1957, 28 p.

The periodic variation of the crystal structure type of the laves phases of titanium, zirconium, hafnium, columbium and tantalum may be correlated with electronic variations. Allotropy is the exception rather than the rule and occurs only for those binary phases that have electron:atom ratios near a critical value. Consideration of ternary laves-type phases indicates that there are two Brillouin zone overlaps governing the structure type. 27 ref. (M26; Ti, Zr, Hf, Cb, Ta)

345-M. **Thorium-Zirconium and Thorium-Hafnium Alloy Systems.** E. D. Gibson, B. A. Loomis and O. N. Carlson. *American Society for Metals, Transactions,* v. 50, Preprint No. 24, 1957, 34 p.

The thorium-zirconium and thorium-hafnium systems have been studied by electrical resistance; thermal, microscopic and X-ray methods and phase diagrams have been proposed for each. The thorium-zirconium system was investigated extensively by high-temperature X-ray methods. 13 ref. (M24b; Th, Zr, Hf)

346-M. **Hydrogen-Uranium Relationships.** M. W. Mallett and M. J. Trzeciak. *American Society for Metals, Transactions,* v. 50, Preprint No. 36, 1957, 18 p.

The relationships in the uranium-uranium hydride-hydrogen system were studied. These included the solubility of hydrogen in massive uranium, the sorption of hydrogen by powdered uranium and equilibrium pressures for the plateaus of the pressure-composition isotherms. Phase diagrams were constructed from these data. Also, the rates of diffusion of hydrogen in alpha and beta uranium were determined. 8 ref. (M24b, N15d; U, H)

347-M. **Grain Boundary Movement in Bicrystalline Aluminum.** R. B. Pond and Eleanor Harrison. *American Society for Metals, Transactions,* v. 50, Preprint No. 43, 1957, 11 p.

An investigation of the plastic deformation of aluminum bicrystals having grain boundaries normal to the specimen axis is reported. Data indicate that these "free" boundaries behave quite differently than boundaries which contain the specimen axis and are therefore influenced by a grip effect. A technique for producing transverse boundaries is described. Stress-strain diagrams for such specimens are given which show that the index of strain hardening for bicrystals whose boundaries are free to translate is lower in the plastic region than the index for single crystals of the parent orientation. 14 ref. (M27f, Q24; Al)

348-M. **Relation Between Constitution and Ultimate Grain Size in Aluminum-1.25% Manganese Alloy 3003.** Philip R. Sperry. *American Society for Metals, Transactions,* v. 50, Preprint No. 49, 1957, 33 p.

The major microstructural difference between wrought products from 3003 aluminum alloy ingot which has or has not been given a high-temperature homogenization heat treatment lies in the greater quantity of fine precipitate particles in the latter. This high concentration of constituent particles leads to a modification of the normal recrystallization process in a manner which favors the formation of coarse recrystallized grains. The grain size in either case is a function of the recrystallization process only, subsequent grain growth being negligible. 16 ref. (M27c, N5; Al, 4-3)

349-M. **The Tantalum-Columbium Alloy System.** D. E. Williams and W. H. Pechin. *American Society for Metals, Transactions,* v. 50, Preprint No. 54, 1957, 15 p.

The constitutional diagram is an unbroken series of solid solutions. No evidence of a solid transformation was found in any of the alloys. The solidus line rises smoothly from the melting point of

columbium, 2420° C., to the melting point obtained for tantalum, 2940° C. and the liquidus was found to follow quite closely the path taken by the solidus. 4 ref. (M24b, Ta, Cb)

350-M. Partial Phase Diagrams of the Systems Mg-Th and Mg-Th-Zr. A. S. Yamamoto and W. Rostoker. *American Society for Metals, Transactions,* v. 50, Preprint No. 55, 1957, 24 p.

A phase diagram for the Mg-Th system up to 70% has been constructed showing an intermediate phase Mg, Th forming by a peritectic reaction and a eutectic reaction forming (Mg + Mg, Th) from the melt at 42% Th and 582° C. The maximum solid solubility of Th in Mg has been set at 4.5%. A tentative vertical section for Mg-Th-1% Zr has been outlined. A ternary peritectic reaction has been postulated to account for unusual cast microstructures. The limit of the Mg terminal solid solution does not appear to be appreciably altered by additions of Zr. 9 ref.
(M24b, M24c; Mg, Th, Zr)

351-M. Etchant for Stainless Type 403 Forgings. Richard D. Buchheit. *Metal Progress,* v. 72, Sept. 1957, p. 95-96.

Electrolytic method for etching nickel-base, chromium-base and high-alloy steels. (M20q; SS, 4-1)

352-M. Contributions to the Nowotny Phases. Edwin Parthé. *Powder Metallurgy Bulletin,* v. 8, June 1957, p. 23-34.

Investigation by X-ray diffraction of Nowotny phases in metal silicide systems with carbon, nitrogen or oxygen additions; discusses lattice constants, compositions of hexagonal structures for Nowotny phase and two tetragonal structures with titanium, zirconium, hafnium, vanadium, columbium, tantalum, chromium, molybdenum or tungsten as metal components. 26 ref.
(M26r; 6-20, Si)

353-M. X-ray Study of Carbide Phase of Patented Steel Wire. V. M. Golubkov and V. K. Kritskava. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 461-464. (*Henry Brutcher Translation* no. 3950.)

X-ray determination of the dimensions of blocks in carbide particles of patented 0.80% carbon steel wire after various cold reductions and after tempering at different temperatures; interpretation of X-ray diagrams obtained by ionization method; size of blocks; distribution of carbide particles in ferrite.
(M26r, MM22g, ST, 4-11)

354-M. Use of Electron Diffraction for the Study of Oxide Films on the Surface of Cemented Carbides. K. P. Imshennik and V. A. Landa. *Zavodskaya Laboratoriya,* v. 23, no. 6, 1957, p. 699-702. (*Henry Brutcher Translation,* no. 4041.)

Merits of electron diffraction for revealing the presence of titanium dioxide on as-delivered and on oxidized surfaces of tool tips high in titanium carbide, and of tungsten oxide on surface of oxidized specimens low in, or containing no titanium carbide. Method recommended for removing titanium dioxide from tips before brazing them onto tool shanks. (M22h; SGA-j, 6-20, 14-12)

355-M. (Czech.) **Quantitative Metallographic Lattice Analysis.** Stanislav Drapal, Vratislav Horalek and Zdenek Rezny. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 485-491.

Study of relations between range of measurement, degree of accuracy and probability of obtaining this accuracy in quantitative metallographic lattice analysis. A comparison of results of extensive measurement obtained in using the lattice method and random point method showed accuracy of both methods to be the same and conclusions derived by means of mathematical statistics for random points method can be applied to lattice method. 8 ref.
(M26)

356-M. (French.) **A Very Senstive Micrographic Method for Detecting Hydrogen in Alpha Uranium.** Andre Robillard and Daniel Calais. *Comptes Rendus,* v. 245, July, 1957, p. 59-62.

Halated phase of uranium; heat treatments which provide best conditions for detection of last traces of hydrogen in alpha uranium in hydride form. 6 ref. (M23; U, *H*)

357-M. (French.) **Persistence of Networks of Impurities and Imperfections in a Pure Iron After Various Heat Treatments.** Pierre Coulomb. *Comptes Rendus,* v. 245, Aug. 12, 1957, p. 799-802.

Micrographic etching reveals pattern of previous boundaries and subboundaries in a 99.96% pure iron, thereby demonstrating stability of reticular structures of impurities and imperfections. 6 ref.
(M26s, M27f; Fe-a)

N Transformations and Resulting Structures

334-N. The Precipitation of ε-Carbide by Aging of Soft Steel. N. Hansen and E. W. Langer. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 422-424.

Hardness variations observed and the formation of precipitate followed by electron microscope during aging of soft steel specimens at 250° C. First precipitate observed after maximum hardness values are past. Needle shaped precipitate assumed to be the epsilon. (N27a; CN)

335-N. Note on the Transformation of Austenitic Manganese Steel. A. E. Smith. *Iron and Steel Institute, Journal,* v. 186, Aug. 1957, p. 425-428.

Investigation of changes in microconstituents and hardness resulting from transformations in quenched austenitic (Hadfield) manganese steel, following isothermal treatments for temperatures ranging from 300 to 920° C. Isothermal transformation of austenite to austenite plus carbide and pearlite. 7 ref. (N8g; AY, *Mn*)

336-N. The Factors Which Influence the Transition From White to Gray Tin. A. I. Bykhorskii. *Soviet Physics,* v. 1, no. 8, p. 1746-1747. (Translated by American Institute of Physics.)

Explanation of influence by considering surface activity with respect to tin of contaminants present. 12 ref. (N6p; Sn)

337-N. (Czech.) **Eutectoid Reaction. Pt. 1. Pearlite Reaction in Carbon Steels.** Josef Cadek. *Hutnicke Listy,* v. 12, no. 7, 1957, p. 585-592.

Critically reviews data from literature on pearlite reaction in carbon steel; discusses various attempts on theoretical analysis of pearlite reaction and its parameters. 42 ref.
(N8h, ST)

338-N. (French.) **Influence of Variations in Austenite Composition on Tempering Characteristics of Thermal Martensite in 18% Chromium and 2, 4, or 6% Nickel Steels.** Paul Bastien and Alain Sulmont. *Comptes Rendus,* v. 244, June 17, 1957, p. 3056-3059.

Influence of variations of austenite composition can be quite accurately studied by determining, by means of dilatometry, shifts in Ms point.
(N8p; AY, *Cr, Ni*)

339-N. (German.) **Behavior of Non-Alloyed Carbon Steels Toward Hydrogen Under Plastic Deformation.** Friedrich Erdmann-Jesnitzer. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 355-365.

The influence of plastic deformation such as upsetting was investigated on iron cylinders, after cathodic loading with hydrogen. The results show that the release of hydrogen takes place mainly when reaching the yield point. The releasing speed surpasses the normal over 100 times. Also the quantity of hydrogen released is greater. Explanation of hydrogen embrittlement is given. 26 ref.
(N15d, Q26s, Q24; Fe, CN, *H*)

340-N. (German.) **Influence of Electrolytic Transfer of Carbon on the Aging of Alpha-Iron.** Friedrich Erdmann-Jesnitzer and Klaus Ouvrier. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 423-431.

To prove the existence of carbon ions in alpha-iron the following experiments were carried out; transfer of carbon at a temperature of 700 to 800° C.; observation of the quench-aging process through continuous measuring of hardness and electrical resistance with or without additional current. At 825° C. diffusion of carbon toward the cathode was observed proving the existence of carbon ions. The valence was found to be between +2 and +3.6 depending on the current density.
(N7a; Fe, *C*)

341-N. (German.) **Martensitic Transformations in the Forming of Homogenized Beta Brass.** Erhard Hornbogen, Armin Segmüller and Günter Wassermann. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 379-384.

The behavior of homogenized B-Ms60 both as single crystals and as polycrystals is investigated in the forming process. $Beta_1$ is transformed under tensile stress into martensitic crystals. The new phase may be described as being an alpha-brass with straightened out tetragonal structure of the CuAu-type. In the form of transformation between $beta_1$ and $alpha_1$ an unknown structure $alpha_2$ of a lower symmetrical order exists. 10 ref.
(N6q, 3-18; Cu-r)

342-N. (German.) **Observations With an Electron Microscope on the Structural Changes Taking Place in the Drawing and Recrystallization Process of Copper Wire.** Walter Feitknecht and Edgar Freudiger. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 384-390.

Electrolytic copper of various degrees of purity is examined as to its substructure after various deformation and recrystallization treatments. The different forms of the substructure may be explained by the fact that the attack of the etching agent starts at points of accumulation of dislocations and proceeds along directions of lightest rate of solution, especially along (111) and (110) directions. 10 ref.
(N5, M21e; Cu, 4-11)

343-N. (German.) **Observations With an Electron Microscope on the Precipitation of Copper From Cyanidic Electrolytics Along the Boundary Line Between Films.** Ludwig Reiner. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 390-393.

The precipitation of copper films of various thicknesses from cyanidic electrolytes on a coarse-grained carrier metal and a copper single crystal is examined using electron microscope bright and dark field observation. Nickel films are used as replicas. Information is obtained about the crystalline structure of films. 3 ref. (N12d, M21e; Cu, 14-12)

344-N. (German.) **Precipitation of Bismuth in Copper.** Guido Bassi. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 394-395.

Observation of copper with .015% Bi has shown that accumulations of bismuth may occur in materials which were not previously subjected to severe deformation at temperatures beyond 900° C. This may be due to the cast structure. An artificial precipitation of bismuth can be obtained by a slight deformation and annealing at 500° C. The solubility of bismuth in copper turned out to be at least 0.015% which is more than assumed up to the present. 3 ref. (N7, P12e; Cu, *Bi*)

345-N. (German.) **On the Origin of Stains Appearing on the Surface of Cathodic Copper Subjected to Fatigue Strain.** Masahiko Suzuki. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 395-398.

Formation of stains on copper-plated material is due to the fatigue of the copper-plating itself; the structural changes causing the stains start from the boundary between base metal and plated metal and proceed toward the surface. Progress depends on the number of stress repetitions. 6 ref.
(N12d, Q7, L17; *Cu)*

346-N. (Japanese.) **Study on Acicular Cast Iron; the Effect of Manganese.** Yoichi Tokunaga. *Casting Institute of Japan, Journal,* v. 29, April 1957, p. 215-217.

Iron-molybdenum-copper-manganase system studied; cooling curves of molybdenum-manganese cast iron; martensite-acicular-pearlite transformation. (N8; CI-q)

347-N. (Russian.) **The Influence of Alloying Elements on the Content and Mobility of Hydrogen in Steel.** Yn. A. Kliachko & T. A. Izmanova, *Stal',* v. 17, 1957, p. 507-511.

Which alloying elements aid separation of hydrogen at comparatively low temperatures, and which hamper it. Influence on plastic deformation. (N15d, Q24, 2-10; ST, *H)*

348-N. Grain Growth and Recrystallization Studies on Commercial Titanium, RC-55, and Alloy, Ti-100 A. E. L. Bartholomew, Jr. *American Society for Metals, Transactions,* v. 50, Preprint No. 1, 1957, 19 p.

The influences of prior to deformation grain size, amount of cold deformation, annealing temperature and time on the grain size of cold worked and annealed titanium (RC-55) and alloy (Ti-100A) were investigated. Isothermal annealing of cold rolled titanium (RC-55) was also carried out to establish recrystallization rates and to investigate grain growth in the absence of recrystallization. 9 ref.
(N3, N5, 2-14, 3-18; Ti)

349-N. Growth of Cadmium From the Vapor. J. E. McNutt and R. F. Mehl. *American Society for Metals, Transactions,* v. 50, Preprint No. 6, 1957, 39 p.

Technique for making continuous microscopic and interferometric observations of cadmium crystals while they are actually growing by deposition from cadmium vapor at constant temperature and supersaturation. Selected observations on the changes occurring on basal hexagonal surfaces during experiments with various supersaturations and deposit temperatures within 50° C. of the melting point are reported. 17 ref. (N15g; Cd)

350-N. Solubility of Carbon in Thorium. Robert Mickelson and David Peterson. *American Society for Metals, Transactions,* v. 50, Preprint No. 7, 1957, 14 p.

The solubility of carbon in thorium has been investigated and the limit of solubility has been determined at four temperatures. X-ray data, hardness readings and metallographic examinations of heat treated specimens were combined to obtain the following solubility limits; room temperature-0.35% carbon, 800° C.-0.43% carbon, 1018° C-0.57% carbon, and 1215° C.-0.91% carbon. (N12p, Th, C)

351-N. Classification of Precipitation Systems. R. O. Williams. *American Society for Metals, Transactions,* v. 50, Preprint No. 13, 1957, 13 p.

It is proposed that all precipitation systems be classified according to three structural characteristics: degree of complexity of nucleation, the shape of the particles formed and the degree of order in the matrix and precipitate. 17 ref.
(N7b)

352-N. Transformation Kinetics and Mechanical Properties of Zr-Ti and Zr-Sn Alloys. R. F. Domagala, D. W. Levinson and D. J. McPherson. *American Society for Metals, Transactions,* v. 50, Preprint No. 19, 1957, 26 p.

Three zirconium-titanium and three zirconium-tin alloys based on sponge zirconium were prepared by arc melting and forging. Transformation kinetics of these alloys were investigated. The zirconium-titanium compositions, prototypes of alpha and beta isomorphous alloys, demonstrated a general lack of response to heat treatment. Significant improvements in impact strength and optimum conditions for other mechanical properties were developed by finish-forging 5 and 15% Ti alloys in the alpha and beta field. A correlation between hardness and tensile strength was observed. 7 ref.
(N6, N7, Q general, Zr, Ti, Sn)

353-N. Transformation Kinetics of Zirconium-Uranium Alloys. D. L. Douglass, L. L. Marsh, Jr., and G. K. Manning. *American Society for Metals, Transactions,* v. 50, Preprint No. 20, 1957, 25 p.

The transformation kinetics of zirconium alloys containing 8.85, 11.1, 14.3, and 20.7 % uranium have been determined by metallography and X-ray diffraction. The effect of increasing uranium content in the alloys was to retard alpha zirconium precipitation and to accelerate the precipitation of supersaturated epsilon, an intermediate phase. 6 ref.
(N6, N7; Zr, U)

354-N. Effect of Aging Cycle on the Properties of an Iron Base Alloy Hardened with Titanium. T. W. Eichelberger. *American Society for Metals, Transactions,* v. 50, Preprint No. 21, 1957, 34 p.

Aging treatment that increases the creep-rupture time for both plain and notch-bar specimens. The notch sensitivity of the material in creep has been greatly reduced by this new aging treatment; however, no change has been produced in the room temperature or 1200° F. tensile properties. 9 ref.
(N7a, J27d, Q3m, Q23s; Fe, Ti)

355-N. Transformation Structures in Hypoeutectoid Alloy Steels. W. C. Hagel and M. N. Ruoff. *American Society for Metals, Transactions,* Preprint No. 25, 1957, 27 p.

Detailed optical and electron-microscopic observations were made of the morphological aspects of both isothermal and cooling transformations in laboratory Ni-Mo, Cr-Mo-V and Ni-Cr-Mo steels containing 0.3% carbon. Transformation curves were obtained by varying isothermal-reaction temperatures from 1300 to 700° F. (705 to 370° C.) and cooling rates from 9 to 30,000 F/hour; resultant structures are more continuous and intermixed in nature than existing classifications indicate. 20 ref. (N8g; AY)

356-N. Phase Relationship in Austenitic Cr-Mn-C-N Stainless Steels. Chi-Mei Hsiao and E. J. Dulis. *American Society for Metals, Transactions,* v. 50, Preprint No. 29, 1957, 43 p.

The stable austenite region in the Cr-Mn-C-N steels containing 0.10/0.80% C, 10/28% Mn, 12/28% Cr, and 0.10/0.80% N has been determined. At 2100° F., the minimum amount of carbon plus nitrogen required for a completely austenitic structure increases with increasing amounts of chromium, and this relationship can be represented by the expression $C+N = 0.078$ (Cr-12.5). When the chromium is over 15%, about 12% manganese is required to stabilize the austenite, and when the chromium is between 12 and 15%, 12 to 18% manganese is required. 25 ref. (N8, N7a; SS-e)

357-N. Morphological and Phase Changes Durnig Quench-Aging of Ferrite Containing Carbon and Nitrogen. G. Lagerberg and B. S. Lement. *American Society for Metals, Transactions,* v. 50, Preprint No. 33, 1957, 33 p.

The quench-aging of a Fe-C alloy (0.016% C), a Fe-N alloy (0.084% No), and two Fe-C-N alloys (0.021% C, 0.028% N and 0.023% C, 0.011% N) was studied by means of light microscopy, electron microscopy and electron diffraction. The following two-stage reactions were found to occur: ferrite supersaturated with carbon→epsilon carbide→cementite; ferrite supersaturated with nitrogen → alpha''-nitride → gamma' nitride; ferrite supersaturated with both carbon and nitrogen epsilon→carbonitride→cementite. 21 ref.
(N7a; CN)

358-N. The Mode of Hydride Precipitation in Alpha Titanium and Alpha Titanium Alloys. Tien-Shih Liu and

Morris A. Steinberg. *American Society for Metals, Transactions,* v. 50, Preprint No. 34, 1957, 47 p.

Under favorable conditions of hydride precipitation and growth, the appearance of the hyrrides in unalloyed and alloyed (Ti-3% Al, Ti-3% Ta, Ti-2% V, and Ti-10% Zr) alpha titanium are basically the same —thin needles. The precipitation tends to take place along slip lines and twin markings, when the surface energies are higher than surrounding areas. (N7b; Ti)

359-N. Factors Affecting the Absorption and Distribution of Hydrogen in Titanium During Acid Pickling. C. R. McKinsey, M. Stern and R. A. Perkins. *American Society for Metals, Transactions,* v. 50, Preprint No. 38, 1957, 25 p.

Hydrogen pickup results from corrosion of the metal and can be minimized by passivation of the surface or alteration of the cathodic reaction. Hydrogen pickup in predominantly alpha alloys is shown to be confined to a thin surface layer which is stable at temperatures below 100° C. 19 ref. (N15a, L12g; Ti)

360-N. Some Aspects of the Morphology and Chemistry of Lead in Leaded High Sulphur Steels. J. W. Thurman, E. J. Paliwoda and E. J. Duwell. *American Society for Metals, Transactions,* v. 50, Preprint No. 50, 1957, 28 p.

An experimental ingot of leaded high sulphur steel has been examined, with the aid of microradiography, in both the as-cast and hot rolled conditions. It appears that virtually all the lead can be revealed by a microradiographic technique. The processes of solidification cause the lead to become entrapped in the same interdendritic regions in which manganese sulphide (and other nonmetallic) form. Thus, lead and manganese sulphide remain in close physical association in the steel. 16 ref. (N12c, M23n; AY, Pb)

361-N. Grain Boundary Self-Diffusion of Nickel. W. R. Upthegrove and M. Sinnott. *American Society for Metals, Transactions,* v. 50, Preprint No. 52, 1957, 30 p.

The diffusion of Nickel-63 into controlled orientation bicrystal grain boundaries of nickel in the temperature range 700-1100° C. has been studied using autoradiographic techniques. The ratio of the grain boundary diffusion coefficient to the lattice diffusion coefficient has been shown to vary from 10^3 to 10^7, depending on the grain boundary angle and the temperature of diffusion. 13 ref. (N1d; Ni)

362-N. Effect of Interstitial Atoms on the Self-Diffusion of Metal. M. A. Krivoglaz and A. A. Smirnov. Problems of Metal Physics and Metallography, a Collection of Papers from the Metal Physics Laboratory of the Ukrainian Academy of Sciences, no. 5, 1954, p. 128-137. (*Henry Brutcher Translation* no. 3929.)

Drop of the energy of activation for self-diffusion of iron in lattice of gamma iron and exponential reduction of pre-exponential factor in equation for diffusion coefficient, both brought about by the addition of minute amounts of carbon. Theoretical interpretation of this phenomenon based on simple concepts about diffusion in alloys.
(N1d, P13a)

363-N. Formation of Sigma Phase in High-Alloy Austenitic Steels and Alloys. E. M. Pivnik. *Fizika Metallov i Metallovedenie,* v. 2, no. 3, 1956, p. 531-537. (*Henry Brutcher Translation* no. 3981.)

Previously abstracted from original. See item 459-N, 1956. (N8, AY)

364-N. Mechanism of Action of Aluminum Upon Secondary Austenite Grain in Steel. D. S. Kamenetskaya and I. B. Piletskaya. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 103-112. (*Henry Brutcher Translation* no. 4033.)

Effect of aluminum dissolved in steel upon the nucleation of secondary austenite centers and on their growth. Conclusions drawn as to influence of aluminum on boundary and surface energies and on activation energy in nucleation and growth of secondary austenite.
(N2, N3, P13A; ST, *Al*)

365-N. Use of Tritium for Study of Behavior of Hydrogen in Metals. A. I. Chizhikov and V. K. Boyarshinov. *Zavodskaya Laboratoriya,* v. 23, no. 1, 1957, p. 11-14. (*Henry Brutcher Translation* no. 4039.)

Usefulness of tritium for obtaining information on bond strength, diffusion and solubility of hydrogen in metals and alloys; arrangement for preparing gaseous hydrogen containing tritium; details on a counter for recording the beta radiation of tritium; set-up for loading metals and alloys with tritium-labeled hydrogen and for its extraction from metals and alloys. (N15d, *H*)

366-N. (Czech.) **Influence of Tungsten on the Kinetic Parameters of the Formation of Hypo-Eutectoid Ferrite.** Karel Mazanec and Josef Cadek. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 492-500.

Influence of tungsten on the velocity of nucleus formation and the growth of hypo-eutectoid ferrite in the isothermal disintegration of austenite. Relation between effect of tungsten on nucleus formation incubation period and temperature. 23 ref. (N2, N8; ST, *W*)

367-N. (French.) **Micrographic Observation of the Recrystallization, at Low Temperature, of Aluminum Refined by the Zone Melting Process.** Philippe Albert and Omourtague Dimitrov. *Comptes Rendus,* v. 245, Aug. 5, 1957, p. 681-683.

Development of new method of electrolytic polishing and anodic oxidation of pure aluminum at low temperature (−60° C.) made it possible to determine micrographic structure of specimens recrystallized at −38° C. after 97% reduction by cold rolling. (N5, 2-13, M20p; Al)

368-N. (French.) **Bainitic Transformation in Steels.** L. Habraken. *Revue de Metallurgie,* v. 53, Dec. 1956, p. 930-944.

Study by means of electronic metallography of bainitic transformation in hypereutectoid carbon or alloy steels; mode of formation of probainitic ferrite; reasons for stabilization of austenite; how granular and acicular transformations occur; development of bainitic transformation. 17 ref. (N8m; ST)

Physical Properties

358-P. Density and Viscosity of Titanium Tetrabromide. J. M. Blocher, Jr., R. F. Rolsten and I. E. Campbell. *Electrochemical Society, Journal,* v. 104, Sept. 1957, p. 553-555. (CMA)

Density and viscosity measurements of liquid titanium tetrabromide were conducted and data are tabulated. These data may be represented respectively, by the equations $d = 2.953 - 0.00225$ g. per cc. (t in °C) and $\log \eta = 102{,}310T^{-2} - 177.12T^{-1} - 0.1947$ (T in °K). Vapor density measurements show that titanium tetrabromide vapor is monomeric and undissociated at the boiling point. 4 ref. (P10a, P10f; Ti, 14-18)

359-P. Heat Capacity of Holmium From 15 to 300° K. B. C. Gerstein, et al. *Journal of Chemical Physics,* v. 27, Aug. 1957, p. 394-399. (CMA)

Heat capacity maxima are at 19.4 and 131.6° K.; data are tabulated. The lower maximum shows a dependence on thermal history. Thermodynamic functions have been tabulated and entropy correlations were made. P12r; Ho)

360-P. Nickel Alloys With Special Properties. C. Gordon Smith. *Metal Industry,* v. 91, Aug. 23, 1957, p. 145-147.

Notes low expansion of certain nickel-iron alloys and the variation of Young's modulus and temperature coefficient for different nickel-iron compositions; applications making use of these properties.
(P11g, Q21a; Ni, 17-7)

361-P. Nickel Alloys With Special Properties. C. Gordon Smith. *Metal Industry,* v. 91, Aug. 30, 1957 p. 169-170.

Permeability and saturation values for nickel-iron alloys; magnetic properties and magnetostriction; applications. (P16; Ni)

362-P. Atomic Heats of Calcium, Strontium and Barium Between 1.5° and 20° K. L. M. Roberts. *Physical Society, Processing,* v. 70, 452 B, Aug. 1, 1957, p. 738-743.

Atomic heats of calcium, strontium and barium have been measured with the primary object of obtaining values for the electronic contributions to the specific heats. 7 ref. P12r, P15g; Ca, Sr, Ba)

363-P. Atomic Heats of Lithium, Sodium and Potassium Between 1.5° and 20° K. L. M. Roberts. *Physical Society, Processings,* v. 70, 452 B, Aug. 1, 1957, p. 744-752.

Atomic heats of lithium, sodium and potassium have been measured chiefly with the object of determining the effective mass of the conduction electrons. 16 ref.
(P12r, P15g; Li, Na, K)

364-P. The Effect of Pressure on the Electrical Resistance of Copper at Low Temperatures. J. S. Dugdale and D. Gugan. *Royal Society, Proceedings,* v. 241, Aug. 20, 1957, p. 397-407.

Resistivity of commercially pure copper and an alloy of 0.056 at. % iron in copper under hydrostatic pressures up to 3000 atm. measured at temperatures between 4° K. and room temperature. Effect of pressure on ideal resistivity is in agreement with theoretical expectations and is governed chiefly by effect of pressure on the lattice vibrations. 24 ref. (P15g, 3-24, 2-13; Cu)

365-P. Secondary Electron Emission in Copper, Germanium and Tin in the Solid and Liquid States. V. G. Bol'shov and V. K. Seleznev. *Soviet Physics,* v. 1, No. 8, p. 1612-1618.

Measurements of coefficient of secondary electron emission; effects of temperature variations and fu-

sion; measurements of energy distribution of secondary electrons for tin. 12 ref. (P-15k; Cu, Ge, Sn)

366-P. Tantalum Field Emission. M. I. Elinson and G. F. Vasil'es. *Soviet Physics,* v. 1, No. 8, p. 1623-1625. (Translated by American Institute of Physics).

Effects of temperature on boundary changes and rate of emission current. Behavior of tantalum compared with tungsten. 2 ref. (P15k; Ta)

367-P. (English.) **Some Factors Affecting the Decay of Secondary Electron Emission of Silver-Magnesium Alloys.** Masaki Hirashima and Shoichi Miyashiro. *Physical Society of Japan, Journal,* v. 12, July 1957, p. 770-777.

The secondary emission yield is observed to decay very rapidly under electron bombardment especially during the exhaust process using oil diffusion pump. Factors affecting the decay, a method of remedy to make the decayed yield recover, and effects of various gases and vapors on the yield. 13 ref. (P15k; Ag, Mg)

368-P. (Czech.) **Activation Energy of the Viscosity of Molten Metals.** Antonin Hrbek. *Hutnické Listy,* v. 12, no. 7, 1957, p. 593-597.

Activation energy of viscosity and "reduced activation energy of viscosity"; values of reduced activation energy in relation to temperature for sodium, aluminum, potassium, iron, copper, zinc, silver, cadmium, tin, antimony, gold, mercury, lead and bismuth. Derived equation expressing relation of viscosity and temperature. 32 ref. (P10f, P13a; 14-10)

269-P. (German.) **Measurement of the Coefficient of Diffusion and the Solubility of Hydrogen in Aluminum and Copper.** Walter Richenauer and Alfred Pebler. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 373-378.

From the measurement of degassing characteristics with a newly developed apparatus the coefficients of diffusion of hydrogen in differently shaped aluminum and copper bodies and its solubility in the two metals were determined. Sievert's square-root-law for the solubility of hydrogen in copper was confirmed from measurements at various temperatures. From the observations it may be deduced that diffusion is the primary factor is solubility. 15 ref. (P12e, N1a; Al, Cu, *H)*

370-P. (French.) **The Electronic Component of the Specific Heat of Transition Metals.** R. Blanpain. *Societe Royale des Sciences de Liege, Bulletin,* v. 27, Apr. 1957, p. 165-181.

Sommerfeld coefficient values for transition elements are studied in connection with number of valence electrons and an empirical *d* band structure is established. This is compared with theoretical curves of density of *d* states. Further experimental study is suggested, particularly for the manganese group, for which theoretical predictions do not seem to be confirmed by experience. 57 ref. (P12r; Mn)

371-P. (French.) **The Specific Electronic Heat of Rhenium.** R. Blanpain. *Societe Royale des Sciences de Liege, Bulletin,* v. 27, Apr. 1957, p. 182-188.

Value of Sommerfeld coefficient for rhenium is deduced from calorimetric data in field of intermediate temperatures (20 to 300° K.) and compared with values obtained from magnetic study of this supraconductor. 18 ref. (P12r; Re)

372-P. Effect of Manganese on the Curie Point of Cementite. Earl C. Roberts. *American Society for Metals, Transactions,* v. 50, Preprint No. 11, 1957, 21 p.

By determining the curves showing the gradual loss of cementite ferromagnetism with temperature for three series of annealed steels, a generalized graph relating the Curie temperature of the cementite to the manganese content of the cementite has been drawn. 20 ref. (P16d, 2-10; ST, Mn)

373-P. Growth of Uranium Upon Thermal Cycling. J. E. Burke and A. M. Turkalo. *American Society for Metals, Transactions,* v. 50, Preprint No. 17, 1957, 17 p.

The driving force is the stress that develops between differently oriented anisotropic uranium grains when the temperature is changed. At high temperatures this stress is relaxed by viscous flow at the grain boundary, and at low temperatures by crystallographic slip in some of the grains. The two mechanisms of relaxation are shown to combine to produce a "thermal ratchet" which causes continued elongation of textured polycrystalline uranium on thermal cycling. 6 ref. (P10d, P11; U)

374-P. Effects of Cycling Variables Upon Growth Rate of 300° C. Rolled Uranium. R. M. Mayfield. *American Society for Metals, Transactions,* v. 50, Preprint No. 37, 1957, 18 p.

Thermal cycling growth rate of 300° C. rolled uranium rods has been shown to be profoundly affected by cycling variables such as heating and cooling rate, temperature limits, temperature range and holding times at temperature. For any appreciable growth to occur, the upper cycling temperature must be above 350° C. For a constant cycling temperature range, maximum growth rates per cycle are observed with slow heating and fast cooling. Minimum rates are obtained with fast heating and slow cooling, and equal rates yield intermediate values. 10 ref. (P10d, P11; U)

375-P. Effects of Fabrication and Heat Treatment Variables Upon the Thermal Cycling Behavior of Uranium. S. T. Zegler, R. M. Mayfield and M. H. Mueller. *American Society for Metals, Transactions,* v. 50, Preprint no. 56, 1957, 37 p.

Cycling variables, specifically heating and cooling rates, are shown to have a pronounced effect on the growth of beta-treated uranium. The temperature of beta-phase heat treatment influences growth only slightly. The time at temperature, cooling rate and the fabrication history of the material prior to heat treating are shown to have no effect on the growth of beta treated material. The cooling rate on beta heat treatment is shown to be the major factor influencing surface wrinking. 5 ref. (P10d, P11, 3-18, 2-14; U)

376-P. Properties of Palladium-Rhodium Alloys. F. E. Hoare and J. Preston. *Nature,* v. 180, Aug. 17, 1957, p. 334.

Investigation covering magnetic properties of a range of alloys and pure metals and low-temperature specific heats of four palladium-rhodium alloys and interpretation of results by band theory. (P16, P12r; Pa, Ph)

377-P. Effect of Some Metal Additions on Molybdenum Disilicide. R. D. Grinthal. *Powder Metallurgy Bulletin,* v. 8, June 1957, p. 18-22. (CMA)

Electrical resistivity, modulus of traverse, hardness, impact strength and oxidation resistance effects on molybdenum disilicide from adding copper, titanium and chromium were studied. (P general, Q general, 2-10; Mo, 6-20)

378-P. New Method of Studying Equilibria in Metal-Slag Systems. V. F. Surov, O. V. Travin and L. A. Shvartsman. Problems of Metallography and Metal Physics, 4th Collection of Papers, 1955, Moscow, p. 616-250. (*Henry Brutcher Translation* no. 3933.)

New method for determining the desulphurizing and dephosphorizing power of slags over a wide range of compositions set-up and procedure, based on use of sulphur[35] and phosphorus[32], respectively. (P12d, 1-4; RM-q)

379-P. Solubility of Oxygen in Manganese-Containing Liquid Iron. B. V. Linchevskii and A. M. Samarin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 9-18. (*Henry Brutcher Translation* no. 4030.)

Determination of the deoxidizing power of manganese within a wide range of concentrations; nature of oxidation products; influence of manganese on activity of oxygen dissolved in iron-managanese melts. Solubility of oxygen in liquid iron; oxidation of manganese dissolved in liquid iron studied by fixing the equilibrium state in system "liquid metal-solid or liquid oxide phase—steam-hydrogen mixture" at controlled metal temperatures and gas-phase compositions. Deoxidation of iron with manganese; calculations of dissociation pressure of solid manganous oxide at 1600° C.; activity of oxygen in iron-manganese melts as function of manganese content. (P12e; Fe, *Mn,* AD-r)

380-P. Effect of Carbon Upon the Solubility of Hydrogen in Liquid Iron-Carbon Alloys. K. T. Kurochkin, P. E. Nizhel'skii and P. V. Umrikhin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* no. 2, Feb. 1957, p. 19-26. (*Henry Brutcher Translation* no. 4031.)

Effect of carbon upon solubility and rate of solution of hydrogen in liquid Fe-C alloys with 0.02% to over 4.3% carbon, as well as upon residual hydrogen content of solid alloys subsequent to their saturation with hydrogen in the liquid state. Particulars on apparatus used in study; formula for calculation of 'hot volume'. (P12e; Fe, *C, H*)

381-P. (French.) **Study of the Ferromagnetic Resonance of Iron Monocrystals at 9500 Megahertz.** A. Strub. *Archives des Sciences,* v. 10, Special Section on 6th Colloque Ampére held at Rennes-St-Malo, Apr. 1957, p. 142-146.

Principal features of an apparatus for measuring X-band hyperfrequencies; apparatus designed for study of various properties of oriented ferromagnetic specimens following orientation of their crystalline axes in relation to directions of static magnetic fields and applied UHF. Preliminary results of measurements on ferrosilicon monocrystals. 5 ref. (P16f, 1-3; Fe, *Si,* SGA-n)

382-P. (French.) **Action at Low Temperature of High-Speed Neutrons on**

Metals Having a Cubic-Centered Structure. Pierre Lucasson. *Comptes Rendus,* v. 245, Aug. 12, 1957, p. 796-799.

Samples of columbium, tantalum and tungsten were irradiated at low temperature and variations of electrical resistance were measured in terms of integrated flux. Isochronic "annealing" was then performed on samples and corresponding variations in resistance were measured. 4 ref. (P15g, 2-17; Cb, Ta, W)

383-P. (French.) **Impurities in Metals and Their Influence of Surface Conditions and Specific Properties.** André Roos. *Peintures-Pigments-Vernis,* v. 33, Aug. 1957, p. 702-710.

Nature and origin of impurities in metal surfaces; effects of impurities on surface properties, with particular attention to diffusion, adsorption and ionic properties; atomic and ionic aspects of metal surfaces; study of ionic emission and surface oxidation by photoelectric reflectometry; study of surface reactions in light of recent theories of physical chemistry. (P13, N1)

384-P. (Slovene.) **Thermodynamics in Metallurgy.** Anton Podgornik. *Rudarsko-Metalurski Zbornik,* no. 2, Summer 1957, p. 95-109.

Survey of contemporary metallurgical thermodynamics. Various measuring techniques, such as measurement of vapor pressures, equilibrium and electromotive forces. Importance of W. Oelsen's thermodynamic analysis is stressed. 14 ref. (P12)

Q Mechanical Properties and Tests

938-Q. "Exotic" Metals Look Good for Tomorrow's High-Temperature Structures. Irwin Stambler. *Aviation Age,* v. 28, Sept. 1957, p. 42-47. (CMA)

Columbium, vanadium and molybdenum as refractory structural metals. Molybdenum appears somewhat inferior as regards general mechanical properties, particularly creep, oxidation resistance. Vanadium metal is weak at 25° C., but the decrease in strength with rising temperature is slow. The V-Ti series of alloy is the only one showing good tensile properties over a wide range of compositions. Data on the mechanical properties of zirconium, hafnium and zirconium alloys are tabulated.
(Q general, 2-12; SGA-h, Cb, V, Mo, Zr, Hf)

939-Q. Properties of Materials at Low Temperatures. Part 3. R. J. Corruccini. *Chemical Engineering Progress,* v. 53, Aug. 1957, p. 397-402.

Factors influencing transition temperature; correlation of ductile-brittle transition with lattice type of metal. (Q23r, 2-13)

940-Q. Brittle Fracture of Mild Steel in Torsion. J. B. Hunt. *Engineering,* v. 184, Aug. 9, 1957, p.173-174.

Impact tests have been made on mild steel speciments in torsion at low temperatures in order to study the variation in stress-strain characteristics as brittle fracture conditions are approached. It was found that a uniform elasto-plastic twist existed and that this twist became a maximum when the over-all ductility began to decrease. Torque-twist curves with a negative slope after yield were obtained.
(Q26s, Q1b; CN)

941-Q. Age "Custom" Properties Into 17-4 PH Castings. D. D. Durgan. *Iron Age,* v. 180, Aug. 29, 1957, p. 67-69.

Data on cast 17-4 PH stainless include mechanical properties after precipitation hardening at various temperatures between 800 and 1200° F. (Q general, 2-14, J27d; SS, 5-10)

942-Q. Bearing Characteristics of Nickel-Base Alloys. R. K. Kozlik. *Machine Design,* v. 29, Aug. 22, 1957, p. 139-142.

Mating of a variety of nickel-base alloys with dissimilar alloys containing hard phases, or soft phases with good lubricating qualities, effects substantial improvements in wear resistant characteristics.
(Q9n; Ri)

943-Q. Titanium Vs. Steel Alloys for High-Temperature Structures. D. D. Cox. *Machine Design,* v. 29, Sept. 19, 1957, p. 184, 186. (CMA)

Titanium alloys and steels are compared as applied to high-temperature structures. Above 600° F. Ti-16V-2.5Al has the advantage over 12 Cr steel, which has only a slight advantage over Ti-6Al-4V as to general efficiency. In many designs, however, the strength-weight ratios at 70° F. are much more important than those at 600° F. At 1000° F., both titanium alloys and steel lose efficiency rapidly.
(Q27a, 2-12; Ti, AY)

944-Q. Severe Abrasion? Try White or Chilled Cast Iron. *Materials in Design Engineering,* v. 46, Aug. 1957, p. 99-101.

Physical and mechanical properties including extremely hard surface and controllable core make alloyed white and chilled iron castings useful in applications requiring wear and abrasive resistance.
(Q9n; CI-p)

945-Q. New Nickel Alloys for High Temperature Service. Randolph P. Dominic. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 115-119.

Data on five new modifications of Inconel and Incoloy—Inconel 700, 702, and 713C and Incoloy T and 901. Improvement in their high-temperature strength results from age hardening characteristics imparted by the addition of aluminum and titanium.
(Q general, 2-12; Ni, SGA-h)

946-Q. High Strength Aluminum Castings. John V. Houston, Jr. *Materials in Design Engineering,* v. 46, Sept. 1957, p. 124-125.

Analysis of properties of two high-strength grades of Type 356 aluminum alloy sand castings (Ductaluminum). (Q general; Al, 5-10)

947-Q. The Effect of Ceramic Coatings on Creep. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 326, 338.

Note on effect of ceramic coatings on creep in nickel-chromium alloys. (Q3m; Ni, Cr, 8-21)

948-Q. Scrap in Deep Drawing Reduced 90%. C. Kenneth Divers. *Metal Progress,* v. 72, Sept. 1957, p. 88-91.

Manufacture of wheel disks and hub caps of brass, stainless, and steel strip with minimum press room scrap has been correlated with preliminary tests on Olsen cup tester. Criteria are load to produce necking and corresponding height of cup.
(Q23q, 1-4, G4b; Cu-n, SS, CN)

949-Q. Two Promising New Titanium Alloys. S. Abkowitz and Dillon Evers. *Metal Progress,* v. 72, Sept. 1957, p. 97-102. (CMA)

Ti-2.5Al-16V was developed in response to the need for a formable sheet alloy which could be aged to high strength. Tensile and yield strengths in the solution treated condition are 110,000 and 50,000 psi.; after age hardening the values are 170,000 and 160,000 psi., respectively. Ti-8Al-2Cb-1Ta was developed as a weldable sheet and bar alloy for high-temperature use. Unlike Ti-8Al, the alloy is thermally stable at high temperatures. Strength and notch sensitivity compare favorably with Ti-5Al-2.5Sn.
(Q23q, Q27a, Q3m, 2-12, 2-14; Ti)

950-Q. On the Causes of Large Plastic Deformations in the Stretching of Metal Samples With Annular Grooves. Yu. I. Likhachev. *Soviet Physics,* v. 1, no. 8, p. 1785-1790. (Translated by American Institute of Physics.)

Appearance of large plastic deformations long before fracture due to penetration of plastic deformation region to axis of sample on both sides of the smallest groove cross section with formation of a closed plastic region containing the elasto-deformed nucleus. 7 ref. (Q24)

951-Q. General Method of Analysis of Primary Creep Data (Including Analysis of Uranium Creep Data). K. R. Merckx. *U. S. Atomic Energy Commission,* HW-50363, May 1, 1957, 21 p.

The experimental results of creep tests run on alpha uranium are analyzed and formulated into a mathematical model for material behavior. 9 ref. (Q3; U)

952-Q. Improvement of the Impact Resistance of Cermets. A. C. Pezzi and H. P. Kling. Sylvania Electric Products, Inc. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 131093, Apr. 1957, 33 p. $1.00.

Appreciable improvement in the impact resistance of cermets through application of a ductile metallic coating; application of 0.018 in. of electrodeposited nickel, bonded by a suitable vacuum heat treatment, raised the cermet's impact strength from 2.65 and 3.36 in-lb. at room temperature and 1800° F., respectively, to values of 21.48 and 18.96 in-lb. at the same temperatures.
(Q6n; SGA-h, 6-20)

953-Q. A Handbook on the Properties of Cold Worked Steels. E. J. Ebert, Case Institute of Technology. (Watertown Arsenal Laboratory), *U. S. Office of Technical Services,* PB 121662, June 1955, 113 p. $3.00.

Data gained from five years of research into the extent to which cold worked steels might replace the more strategic heat treated alloy steels; engineering information is presented in basic handbook format for the use of design and ordnance engineers. First section contains a tabular presentation of the

important engineering properties. Chapters deal with mechanism of cold working, composition effects, residual stresses, directionality, benefits and limitations, and guidelines to selection and cost of the cold worked product.
(Q general, Q24, 1-17; ST)

954-Q. Factors Involved in Brittle Fracture. M. W. Lightner and R. W. Vanderbeck. *U. S. Steel Engineering Sciences,* v. 4, no. 27, 1957, p. 1-57.

Notch toughness tests, the meaning of notch toughness, and the factors involved in failure. 53 ref.
(Q26s)

955-Q. Quality Control of Steels for Welded Penstocks. W. Stauffer and A. Keller. *Welding Journal,* v. 36, Aug. 1957, p. 359s, 365s, 372s.

Mechanical tests used by Escher-Wyss Co. to control quality of ordinary and high-tensile steel plates.
(Q general, 1-4; ST, 7-1, SGB-a)

956-Q. Design—Its Influence on Residual Stress and Brittle Fracture. J. L. Thomas. *Welding Journal,* v. 36, Aug. 1957, p. 387s-392s.

Relationship of residual stress to brittle fracture related to experience with railroad car components; influence of design in alleviating difficulty. (Q25h, Q26s, 17-1)

957-Q. Electro-Slag Welding Process. *Welding Journal,* v. 36, Aug. 1957, p. 381s and 392s.

Summary of tensile, notched impact and fatigue values of welds in steel sections made by Russian electro-slag welding process.
(Q27a, Q6n, Q7a, K1e)

958-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 to 700° C. Introduction.** Kurt Richard. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 245-246.

Large-scale tests are being carried out in a combined effort of various German industries to determine the creep rate and sustained stresses of 44 materials at elevated temperatures. The ultimate objective is to obtain reliable data for 100,000-hr. tests. It is hoped that relations between short-time tests and long-time tests can be established.
(Q3n, 2-12, 1-4)

959-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 1.** Helmut Reiner. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 247-252.

Testing equipment and procedures used; specimen preparation; estimate of errors. (Q3, 1-3, 1-4, 1-10)

960-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 2. Evaluation Procedures.** Gerhard Bandel and Henning Gravenhorst. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 253-258.

Methods applied in plotting curves; comparison with known values; mathematical and graphical procedures. 27 ref. (Q3, 1-4)

961-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 3. Results of Tests on Ferritic Tube Steels.** Eduard Jahn. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 259-267.

Composition of materials tested; results with smooth, notched and welded specimens (to 5000 hr.). 4 ref. (Q3, 1-4, 1-10; ST)

962-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 4. Results of Tests on Ferritic Alloy Steels.** Helmut Holdt. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 269-285.

Influence of alloy components on creep; influence of heat.
(Q3, 2-12, 2-10; AY)

963-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 5. Results of Tests on Austenitic Steels and Alloys.** Karl Bungardt. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 287-304.

Influence of alloy components, notches, welding, cold forming and hot forming. 5 ref.
(Q3, 2-12, 2-10; AY)

964-Q. (German.) **Behavior of High-Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 7. Fatigue Tests on Ferritic and Austenitic Steels at Temperatures Between 500 and 650° C.** Max Hempel. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 311-316.

Results of creep tests compared to fatigue tests on both smooth and notched specimens. Analysis of notch effect. 34 ref.
(Q3, Q7, 2-12; AY, SGA-h)

965-Q. (German.) **Behavior of High Temperature Steels in Long-Time Creep Tests at Temperatures Between 500 and 700° C. Pt. 8. Preliminary Conclusions.** Rudolf Schinn and Wilhelm Ruttman. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 317-325.

Each material tested has individual long-time creep properties at elevated temperatures which cannot be predicted from any known short-time tests. However, it appears that the 20,000-hr. values permit fairly reliable interpolation. 5 ref.
(Q3m, 2-12; ST)

966-Q. (German.) **100,000-Hr. Creep Tests at 500° C. on Steels of Various Composition.** August Thum and Kurt Richard. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1957, p. 325-337.

Long-time creep tests were carried out on 50 steels at test times up to 140,000 hr. In some instances better results were obtained from notched specimens than from smooth ones. Other steels, however, showed increasing embrittlement thus resulting in high notch sensitivity under elevated temperatures and after longtime testing. No relationship between short-time and long-time tests is apparent. 28 ref.
(Q3, 1-4; AY)

967-Q. (German.) **Interpolation of Elevated Temperatures. Long-Time Creep Curves.** Alfred Krisch and Wolfgang Wepner. *Archiv für das Eisenhüttenwesen,* v. 28, May-June 1956, p. 339-344.

The creep curves obtained experimentally from 19 ferritic and 19 austenitic steels for at least two temperatures were tested against mathematical results obtained from the Larson-Miller procedure. The correlation was unsatisfactory and no master curves could be established. There was ±10% accuracy of estimates for 10,000 hr. obtained from creep curves of 100 hr. and 1000 hr. at a 50° C. higher temperature. However, errors up to 40% occurred in some materials. 28 ref. (Q3, 1-4)

968-Q. (German.) **Influence of Crystal Orientation on the Fatigue Strength of Single Alpha-Iron Crystals.** Max Hemple, Albert Kochendörfer, and Emil Hillnhagen. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 417-422.

Specimens were electrolytically polished to avoid surface stresses. The results were plotted in a stress-cycle diagram showing that single crystals of iron are independent of the crystal orientation, while polycrystal iron is strongly influenced by it. Crystal boundaries vertical to the direction of stress tend to lower the cycles sustained. 19 ref.
(Q7a, 3-22; Fe, 14-11)

969-Q. (Italian.) **Results of Mechanical Tests on Samples of Spheroidal Cast Iron.** Edmondo di Giacomo. *Calore,* v. 28, May 1957, p. 187-195.

Samples from eight Italian foundries were tested at ordinary and high temperatures.
(Q general, 2-12; CI-r)

970-Q. (Italian.) **A Mathematical Theory of Deformation of Sheet Subjected to Plastic Bending.** Guido Danese. *Ingegneria Meccanica,* v. 6, Apr. 1957, p. 33-42.

Fundamental concepts of behavior under plastic bending of sheets of nonwork hardening material having much greater length than thickness; presentation of theory, based on differential calculus, which permits direct expression of laws of variation of thickness in relation to degree of bending; illustration of two general methods, based on this theory, designed to solve, graphically or analytically, problem of determination of ratio of final to initial thickness in terms of ratio of radius of internal curvature to initial thickness, or of the inverse parameter.
(Q24, Q5; 4-3)

971-Q. (Japanese.) **Strength of Welded Products.** Otani. *Metals,* v. 27, Aug. 1957, p. 608-613.

Static fatigue and tensile strength of welded structures; effect of defects on the structure.
(Q27a, Q7a; 7-1)

972-Q. (Japanese.) **Effect of Alloy Additions on Creep Strength of Copper.** Koda. *Metals,* v. 27, Aug. 1957, p. 641-644.

Effect of oxygen, phosphorus, silver, manganese, cadmium, chromium, zirconium and titanium in copper on creep strength and elongation. 11 ref. (Q3m, 2-10; Cu)

973-Q. (Japanese.) **Hot Working of Cast Iron.** *Metals,* v. 27, Aug. 1957, p. 659-662.

Mechanical properties of malleable cast iron, white heat cast iron and gray cast iron after hot working; the effect of alloying elements on cast irons; application of hot worked cast irons.
(Q general, 3-18, 2-10; CI)

974-Q. Hot-Hardness Survey of the Zirconium-Uranium System. W. Chubb, G. T. Muehlenkamp and A. D. Schwope. *American Society for Metals, Transactions,* v. 50, Preprint no. 2, 1957, 10 p.

A complete hardness survey of the zirconium-uranium system has been

made at temperatures from room temperature to 900° C. The composition of maximum hardness increases from 40 at. % zirconium at room temperature to 60 at. % zirconium at 600° C. At 700° C., the hardness data indicated the presence of the beta uranium phase in alloys containing 95 and 100 at. % uranium. 6 ref.
(Q29p, M24b; Zr, U)

975-Q. Temperature Stresses in the Two-Phase Alloy, WC-Co. J. Gurland. *American Society for Metals, Transactions,* v. 50, Preprint no. 3, 1957, 16 p.

Thermally induced stresses in the WC constituent of sintered WC-Co alloys were calculated from elastic theory and were measured by X-ray diffraction techniques. The compositions of the alloys ranged from 5 to 37 vol. % cobalt. It was found that compressive stresses act on the dispersed carbide phase of high binder compositions but that tensile stress components become predominant in low binder alloys.
(Q25p; W, Co, 6-19)

976-Q. Deformation and Fracture of Alpha Solid Solutions of Lithium in Magnesium. F. E. Hauser, P. R. Landon and J. E. Dorn. *American Society for Metals, Transactions,* v. 50, Preprint no. 5, 1957, 28 p.

Whereas coarse polycrystalline aggregates of magnesium are brittle at 78° K., alpha solid solutions of lithium in magnesium are ductile. The improved ductility of the lithium alloys of magnesium is associated with the introduction of prismatic (1010) <2110> slip in addition to basal (0001) <2110> slip. 12 ref.
(Q24, M26b; Mg, Li)

977-Q. Some Aspects of Preyield Phenomena in Mild Steel at Low Temperatures. W. S. Owen, M. Cohen and B. L. Averbach. *American Society for Metals, Transactions,* v. 50, Preprint no. 9, 1957, 37 p.

The sequence of events leading to gross yielding at −196° C. has been explored by metallographic techniques, by the observation of strain patterns on long thin prepolished specimens, and by precise strain measurements as a function of stress and time. 23 ref. (Q25n, 2-13; CN)

978-Q. Strain Hardening of Austenitic Stainless Steel. G. W. Powell, E. R. Marshall and W. A. Backofen. *American Society for Metals, Transactions,* v. 50, Preprint no. 10, 1957, 40 p.

The strain-hardening characteristics of types 301 and 304 austenitic stainless steel have been studied as functions of temperature (20 to −263° C.), strain rate (100-fold variation), and stress system (tension, torsion, and compression) and correlated with quantitative measurements of the progress of the martensitic transformation. 34 ref.
(Q24, M, LN8; SSe)

979-Q. Brittle-to-Ductile Transition Temperatures of Binary Chromium Base Alloys. E. P. Abrahamson, II, and N. J. Grant. *American Society for Metals, Transactions,* v. 50, Preprint no. 14, 1957, 17 p.

A correlation between the rate of transition temperature change and the electron configuration of the solute element is shown and a tentative explanation of transition temperatures is put forward. 13 ref. (Q23r; Cr)

980-Q. Mechanical Properties and Heat Treatment of Titanium-Columbium Alloys. L. W. Berger, D. N. Williams and R. I. Jaffee. *American Society for Metals, Transactions,* v. 50, Preprint no. 15, 1957, 21 p.

Mechanical properties of titanium-columbium alloys may be varied considerably by solution treatment in the alpha-beta field to control amount and composition of the retained beta, and alloys containing 20 to 35% columbium may be appreciably hardened by quenching from the beta field followed by aging. 12 ref.
(Q general, J27a, J27d, Ti, Cb)

981-Q. Effect of Per Cent Tempered Martensite on Endurance Limit. F. Borik, R. D. Chapman and W. E. Jominy. *American Society for Metals, Transactions,* v. 50, Preprint no. 16, 1957, 24 p.

The endurance limit drops with the presence of small percentages of nonmartensitic products. As the per cent of martensite decreases below 85%, the endurance limit is not as sensitive to microstructure. 7 ref.
(Q7a, N8p, 3-21; CN, AY)

982-Q. Effect of Microstructure and Heat Treatment on the Mechanical Properties of AISI Type-431 Stainless Steel. G. E. Dieter. *American Society for Metals, Transactions,* v. 50, Preprint no. 18, 1957, 26 p.

Transverse tensile tests on commercial forgings of AISI Type-431 stainless steel have shown that the transverse ductility is considerably improved when the steel does not contain delta-ferrite stringers. Ordinary Type-431 steel with ferrite stringers does not possess adequate transverse ductility when heat treated to a tensile strength of 200,000 psi. Examination of the deformation process showed that the low ductility is the result of localized cracking in the ferrite stringers. 7 ref. (Q27a, 2-14, 3-21; S5)

983-Q. Effects of Temperature-Time Histories on the Tensile Properties of Airframe Structural Aluminum Alloys. R. E. Fortney and C. H. Avery. *American Society for Metals, Transactions,* v. 50, Preprint no. 23, 1957, 16 p.

To obtain generalizations tensile tests were performed at room temperature, 200, 300 and 400° F. after single and sequential exposures sampling the temperature ranges of 300-600° F. (2024-T3) and 250-500° F. (7075-T6) and the time range of 0.1-1000 hr. Statistical calculations were made to determine the degree of conformance of test data and generalized equations. The conclusion was reached that the yield and ultimate strength generalized equations are adequate for analyzing the effects of those service time-temperature exposure histories within the range room temperature to 500° F. and 1.0 to 1000 hr. on the room temperature to 400° F. tensile strengths of subject airframe alloys.
(Q27a, 2-11; Al, SGB5)

984-Q. Mechanical Properties Correlated With Transformation Characteristics of Titanium-Vanadium Alloys. E. L. Harmon, J. Kozol and A. R. Troiano. *American Society for Metals, Transactions,* v. 50, Preprint no. 26, 1957, 35 p.

Microstructural changes in the alloys resulting from variation of alloy content and heat treatment exerted a profound influence on strength and ductility. Increasing vanadium concentration in alloys consisting entirely of alpha prime resulted in higher strength and notch sensitivity, and lower ductility and impact resistance. Alloys containing substantial quantities of omega in the quenched structures exhibited high strength and low ductility. A quenched 11% vanadium alloy was very ductile and possessed an exceptionally low ration of yield strength to tensile strength.
(Q27a, Q23p, N7c; Ti, V)

985-Q. Initiation of Brittle Fracture in Mild Steel. J. A. Hendrickson, D. S. Wood and D. S. Clark. *American Society for Metals, Transactions,* v. 50, Preprint no. 28, 1957, 22 p.

Notched tensile specimens have been tested at temperatures of −30, −79 and −129° C. at rates of application of nominal stress ranging from 10^2 to 10^7 lb/in.^{2} sec. The magnitude of the maximum nominal stress (fracture stress) has been determined for those tests in which brittle fracture occurred. The distribution of stress on the cross-section at the root of the notch at the instant of brittle fracture has been determined analytically. The effect of local plastic deformation at the root of the notch has been taken into account by employing an elastic-plastic stress analysis. 15 ref.
(Q26s; CN)

986-Q. Distribution of Residual Stresses in Carburized Cases and Their Origin. D. P. Koistinen. *American Society for Metals, Transactions,* v. 50, Preprint no. 31, 1957, 24 p.

The residual stress distributions through the carburized cases were correlated with the crystalline phase compositions as determined by X-ray diffraction studies and with the carbon distribution. It is shown that the experimental data support the theory that the origin of the compressive stress in the case lies in the sequence in which transformations occur in the case and in the core. 11 ref.
(Q25h, N8, J28; CN, AY)

987-Q. Carbide Precipitation and Brittleness in Austenitic Stainless Steel. A. Kramer and W. M. Baldwin, Jr. *American Society for Metals, Transactions,* v. 50, Preprint no. 32, 1957, 18 p.

The tensile ductility of three 18-8 austenitic stainless steels — AISI Types 304 ELC (extra low carbon, 0.024% C.), and 302 (0.09% C.) in both the annealed and the sensitized condition (carbide-precipitated condition) was determined as a function of testing temperature (−321 to +500° F.) and strain rate (0.05 to 19,000 in./in./min.). 18 ref.
(Q23p, N8; SSe)

988-Q. Microstructural Changes of Uranium Upon Thermal Cycling. L. T. Lloyd and R. M. Mayfield. *American Society for Metals, Transactions,* v. 50, Preprint no. 35, 1957, 29 p.

Microstructural observations of the deformations that occur in uranium during thermal cycling show that the macro growth embodies phenomena similar to those that occur in creep. Coarse-grained specimens deform by slip, twinning, and localized interactions at the grain boundaries. 18 ref. (Q24, 1-11, Ns; U)

989-Q. Study of the Role of Carbon in Temper Embrittlement. E. B.

Mikus and C. A. Siebert. *American Society for Metals, Transactions,* v. 50, Preprint no. 39, 1957, 19 p.

Electron microscopy and autoradiography using carbon-14 were used to study the distribution of carbon in tough and temper-embrittled structures of a 3140 steel. Isothermal heat treatments up to 500 hr. were investigated. In light of these studies a number of theories on the mechanism of temper embrittlement were evaluated and a new mechanism was proposed based on the development of strained prior austenite boundaries during the embrittling heat treatment. 18 ref. (Q26S, 2-14; AY)

990-Q. Some Properties of Uranium-Low Titanium Alloys. Daniel J. Murphy. *American Society for Metals, Transactions,* v. 50, Preprint no. 40, 1957, 25 p.

Titanium additions over the range 0.1 to 1.5% have been investigated for improvement in mechanical properties and corrosion resistance over those of unalloyed uranium. The effects on microstructure of various heat treatments and cooling rates have been correlated with mechanical properties. (Q general, R general, 2-14; U, Ti)

991-Q. Brittle Fracture of Mild Steel in Tension at −196° C. W. S. Owen, B. L. Averbach and M. Cohen. *American Society for Metals, Transactions,* v. 50, Preprint no. 41, 1957, 22 p.

With the aid of long thin strip specimens loaded at controlled cross-head speeds between 8.9 x 10^{-4} and 1.6 x 10^{-1} in./min., the strain pattern and microscopic changes preceding fracture were observed, and the local strain situation was measured. Specimens heat treated to alter the tendency toward brittle behavior, but maintaining ferrite-pearlite structures, were also examined. 22 ref. (Q26s, 1-13; CN)

992-Q. Machinability of Type-A Leaded Steels. E. J. Paliwoda. *American Society for Metals, Transactions,* v. 50, Preprint no. 42, 1957, 19 p.

The machining uniformity of Type-A leaded steels appears to be subject to the same chemical composition variables which affect the machinability of nonleaded and open-hearth free cutting steel. As in the case of C-1213 steels, oval sulphide inclusions are favorable to the machinability of Type-A steels with stringer-like sulphides being less effective. Lead inclusions mass appears to be dependent on sulphide inclusion nature with fine lead tails being associated with fine stringer-like sulphides. 13 ref. (G17k, 1-10; CN, Pb)

993-Q. Tensile and Stress-Rupture Properties of Chromium. J. W. Pugh. *American Society for Metals, Transactions,* v. 50, Preprint no. 44, 1957, 12 p.

The temperature dependance of the tensile and stress-rupture properties of chromium were evaluated up to 2200° F. The chromium metal used was arc-melted, extruded, and swaged, but was not of special purity. Its ductile-brittle transition temperature for the testing procedure used was about 600° F. No yield points were observed, but some evidence of strain-aging at intermediate temperatures was obtained. 11 ref. (Q27a, Q3m; Cr)

994-Q. Evaluation of a New Titanium-Base Sheet Alloy, Ti-4Al-3Mo-V. R. S. Richards, D. L. Day and H. D. Kessler. *American Society for Metals, Transactions,* v. 50, Preprint no. 45, 1957, 33 p.

Sheet from a production-size ingot of a new titanium-base alloy, Ti-4Al-3Mo-1V, was evaluated on the basis of annealed, solution treated, and solution treated-and-aged properties. Stress-stability tests, cold rolling, welding, and actual forming of parts in the solution treated condition were also performed. (Q general, J27a; Ti, 4-3)

995-Q. Some Relationships Between Torsional Strength and Electron Microstructure in a High Carbon Steel. S. T. Ross, R. P. Sernka and W. E. Jominy. *American Society for Metals, Transactions,* v. 50, Preprint no. 46, 1957, 28 p.

Austempered and quenched and tempered SAE 51100 steel samples were tested to failure in torsion. All oil quenched samples were tempered in the 400-550° F. range. Austempering was also done in this range. The torsional yield strength-hardness relationship was plotted for both austempered and quenched and tempered samples. Representative samples of each heat treatment were examined with the electron microscope. 14 ref. (Q1a, 2-14, M21e; AY)

996-Q. Mechanical Properties of Forged Chromium. S. A. Spachner and W. Rostoker. *American Society for Metals, Transactions,* v. 50, Preprint no. 48, 1957, 20 p.

Procedures for melting, forging and machining chromium. The torsional mechanical properties of an electrolytic grade of chromium in the forged state have been studied in the testing range RT-1000° C. and 0.01-1 in./in./min. The transition temperature of chromium has been related to the amount and temperature of prestrain. Indications are cited that refinement of the recrystallized grain size can depress the transition temperature. 5 ref. (Q23r, Q1a; Cr, 4-1)

997-Q. Energy Stored in Ingot Iron Deformed by Torsion at 25, −82 and −185° C. T. P. Wang and Norman Brown. *American Society for Metals, Transactions,* v. 50, Preprint no. 53, 1957, 30 p.

Stored energy of Armco ingot iron previously deformed at 25, −82 and −185° C. by torsion were measured during its release upon annealing. Energy from 0.3 to 1.1 cal./gm. was found to release in two stages. The first stage of energy release is attributed to recovery. The release of the major portion of the stored energy is concurrent with recrystallization. 23 ref. (Q24, Q1, N5; Te-a)

998-Q. An Aluminum Alloy of 1912. *Light Metals,* v. 20, Sept. 1957, p. 300-301.

Results of tensile, compression, hardness and impact tests made on Ormiston metal; suggested uses for this alloy developed in 1912. (Q general, 17-7; Al)

999-Q. Rate of Strain Nomograph. William H. Mather. *Metal Progress,* v. 72, Sept. 1957, p. 96-96-B.

Nomograph showing strain rate when Young's modulus and load are known. (Q25n, 1-4, 3-17)

1000-Q. Effect of Surface Treatment on the Mechanical Properties of Tungsten. K. Sedlatschek and D. A. Thomas. *Powder Metallurgy Bulletin,* v. 8, June 1957, p. 35-40.

Investigation of effects of electrical polishing on transverse rupture strength, deflection, tensile strength and elongation of surface treated tungsten rods. (Q general, L10b; W)

1001-Q. Arrest of Brittle Fractures in Wide Steel Plates. R. J. Mosborg, W. J. Hall and W. H. Munse. *Welding Journal,* v. 36, Sept. 1957, p. 393s-400s.

Tests were conducted at various combinations of temperature and stress and were concerned with the behavior of welded crack arresters composed of a strake of tough material butt welded to form an integral part of the structure. Under certain conditions such strakes will arrest a propagating brittle crack. (Q26q; ST, 4-3)

1002-Q. Effect of Metallurgical Variables on Transition Behavior in Charpy Slow-Bend and Impact Tests. C. E. Hartblower. *Welding Journal,* v. 36, Sept. 1957, p. 401s-409s.

Variables selected for study were three subcritical heat treatments involving the phenomenon of quench aging and variations in composition by the controlled addition of carbon and manganese as alloying elements. 8 ref. (Q23r, Q6, 2-10; ST)

1003-Q. Mechanism of Flake Formation in Steel. V. S. Mes'kin. *Stal',* v. 16, no. 8, 1956, p. 727-734. (*Henry Brutcher Translation* no. 4010.)

Previously abstracted from original. See item 899-Q, 1956. (Q23, Q26, ST)

1004-Q. Chemical Analysis of the Surface Layers of Metal Exposed to Different Types of Wear. B. I. Kostetskii, N. L. Golego and P. K. Topekha. *Vestnik Mashinostroeniya,* v. 36, no. 10, 1956, p. 25-26. (*Henry Brutcher Translation* no. 4037.)

Special method developed for taking samples of thin surface layers exposed to frictional wear, for simple and accurate chemical analysis; details on wear-testing and sampling arrangement; types of wear obtained at different sliding speeds and under different pressures and the corresponding oxygen (and nitrogen) contents of surface layer. (Q9, S12h, S11)

1005-Q. Effect of Baking Upon Mechanical Properties of Chromium-Plated Steel Parts. V. S. Borisov and F. N. Naumov. *Metallovedenie i Obrabotka Metallov,* no. 12, Dec. 1956, p. 50-56. (*Henry Brutcher Translation* no. 4040.)

Experimental study of the drop in the fatigue strength of steel during chromium plating. Data on effect of thickness of chromium deposit and of tempering (baking) temperature upon tensile strength, elongation and rotating-beam fatigue limit (10-million cycles) of a carbon and a low-alloy steel. Stress state of chromium deposit as function of tempering temperature. (Q27a, Q7a, L17; ST, *Cr*)

1006-Q. (Czech.) **Influence of Deformation Occurring at Room Temperature on the Creep Behavior of Mild Carbon Steel.** Roman Sejnoha. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 102-109.

Results of creep tests performed on mild carbon steel without preliminary deformation and with 11% preliminary deformation. 13 ref. (Q3m; CN)

Corrosion

401-R. Defect Test on U-2°/o Zr Alloy in the X-2 Loop. R. F. S. Robertson. *Atomic Energy of Canada, Ltd.*, CRDC-647, May 1957, 21 p. (CMA)

A sample of 2% Zr uranium sheather in Zircaloy-2 was subjected to a flow of 550° F. water in a reactor flux. A 0.010-in. hole was defected through the sheath. The resulting sequence of events is described. 2 ref.
(R4, T11p, 17-7; U, *Zr*)

402-R. Low-Nickel Stainless Steels. J. G. Henderson. *Chemical Engineering Progress*, v. 53, Aug. 1957, p. 82, 84.

Information on testing program being conducted in chemical industry on corrosion of Type 202.
(R general, R11; SS)

403-R. Corrosion of Metals in Buildings. J. C. Hudson and F. Wormwell. *Chemistry and Industry*, v. 76, Aug. 10, 1957, p. 1077-1089.

A large number of cases of corrosion of ferrous metals are discussed and corrective measures proposed. 12 ref.
(R3, T226n, 17-7; ST)

404-R. Contributions to the Study of Internal Corrosion. J. Morlet and C. Geoffray. *Gas Journal*, v. 291, Aug. 14, 1957, p. 332-334.

Corrosion of steel mains and pipes by synthetic gases, made up from nitrogen, carbon dioxide and oxygen, with or without water, compared with town gas, under different pressures. Suggested control, including limiting oxygen content and dehydration.
(R6p, R6q; ST, EG-m44, 4-10)

405-R. Stress Corrosion of Austenitic Stainless Steel in Steam and Hot-Water Systems. C. Edeleanu and P. P. Snowden. *Iron and Steel Institute, Journal*, v. 186, Aug. 1957, p. 406-422.

Investigation of conditions under which stress-corrosion and cracking occur in austenitic stainless steels in steam and hot water. Effects of temperature, pressure and contamination with chloride or hydroxide ions. 8 ref. (R1d, R4d; SS)

406-R. Corrosion Resistance of No. 20 and No. 20Cb Stainless Steel Welds. Hallock C. Campbell, Thomas J. Moore and S. E. Tyson. *Welding Journal*, v. 36, p. 353s-359s.

Investigation of comparative corrosive behavior of No. 20 stainless weld metal and No. 20 stabilized with columbium in several conditions of heat treatment; analyzes susceptibility to weld cracking and intergranular corrosive attacks.
(R general, R10c; SS, 7-1)

407-R. Stress Corrosion of Titanium Weldments. Russel Meredith and W. L. Arter. *Welding Journal*, v. 36, Sept. 1957, p. 415s-418s. (CMA)

The cause of weld cracking at high temperature in a resistance and fusion-welded tank of RC-A110AT was investigated. Physical testing included hydrostatic pressure testing and tension-compression loading parallel to the longitudinal axis at 270° F., and hydrostatic testing at 700° F. using a chlorinated hydrocarbon as a pressurizing medium. In the latter test numerous transverse weld cracks developed in both kinds of welds. The cause was attributed to free HCl in the hydrocarbon, although the mechanism is uncertain. (R1d; Ti, 7-1)

408-R. (English.) **Studies on Corrosion Resistance of Titanium Alloys. Pt. III. Corrosion Resistance of Ti-Ag, Ti-Cu, Ti-Fe, Ti-Co, Ti-W and Ti-Sn Alloys.** Susumu Yoshida, Shigetake Okamoto and Takashi Araki. *Government Mechanical Laboratory, Journal*, v. 3, no. 1, 1957, p. 56-58. (CMA) (Also in *Journal of Mechanical Laboratory*, v. 11, May 1957, p. 87-93—Japanese.)

Arc-melted, hot and cold rolled specimens of a number of binary titanium alloys were tested in 25° C. and boiling test solutions. Graphs show the corrosion resistance of the alloys in H_2SO_4, HCl, HNO_3, aqua regia, oxalic acid, other organic acids, $FeCl_3$ and $AlCl_3$. (R6g; Ti)

409-R. (French.) **Tarnishing of Metals.** P. Huyskens. *Industrie Chimique Belge*, v. 21, Nov. 1956, p. 1171-1192.

Experimental study of kinetics of tarnishing; principal kinetic laws; migration of defects in ionic network; electrical conductivity of products of tarnishing; theories of tarnishing; orientation of crystalline faces; study of phases; oxidation, halogenation; sulphurization. 87 ref.
(R2r)

410-R. (German.) **Testing of Welded and Nonwelded Austenitic Chromium-Nickel Steels for Intercrystalline Corrosion.** Herbert Zitter. *Archiv für das Eisenhüttenwesen*, v. 28, July 1957, p. 401-416.

Different testing methods for intercrystalline corrosion are compared critically and the isothermal curves of precipitation of carbides at grain boundaries are given. Testing in a solution of hydrofluoric acid and nitric acid lends itself particularly to the testing of welded samples. A mixture of copper sulphate and sulphuric acid is preferable for nonwelded steel. It is shown that the susceptibility of steel to intercrystalline corrosion depends on the welding method, the welding speed and some other factors. Relations between time and temperature are described mathematically. 65 ref.
(R2h, R11h; AY, *Cr, Ni*, 7-1)

411-R. (Italian.) **Corrosion of Puddled Iron.** Nello Collari. *Calore*, v. 28, April 1957, p. 147-153.

Structure of puddle iron; probability and speed of corrosion; possibilities of using new knowledge to produce a less expensive product than puddled iron, but one that will retain its valuable characteristics. 7 ref. (R general; Fe)

412-R. (Italian.) **Corroded Al-Mg Alloy Rivets.** E. Hugony. *Rivista di Meccanica*, no. 162, May 25, 1957, p. 15.

Study of rivets used in naval construction showed corrosion to be intercrystalline; causes were excessive magnesium content (6%) and degree of hardening of the material. Remedies suggested are use of rivets made of 3.5% Mg alloy and annealing of rivets at about 360° C. after fabrication. (R2h, T7f, 17-7; Al, *Mg*)

413-R. (Japanese.) **Study on the Oxidation in Air of Titanium and Its Alloys.** Shiro Ogawa, et al. *Japan Institute of Metals*, v. 21, June 1957, p. 410-414. (CMA)

Weight increases of titanium alloyed with 3-10% Al or 0.3-1.5% Si on exposure to air at 700-800° C. showed that a simple parabolic law was not in operation and that the additions had a slight suppressant action, especially at lower temperatures. Surfaces oxidized at 400-700° C. showed anatase and rutile forms, but those oxidized at 800-1000° C. showed only rutile. Two orientations of rutile were seen at 700-900° C. 11 ref. (R1h; Ti)

414-R. (Norwegian.) **High-Temperature Oxidation of Metals and Alloys.** Per Kofstad. *Teknisk Ukeblad*, v. 104, no. 12, Mar. 21, 1957, p. 225-230.

Mechanics of metal oxidation; Wagner's oxidation theory; oxidation of metals with an electron conducting layer of oxide; formation of several layers of oxide; oxidation of copper and iron.
(R1h, 2-12; Cu, Fe)

415-R. (Spanish.) **Corrosion of Iron by Sulphate Reducing Bacteria in the Mineral Baths at San Diego de los Banos in Pinar del Rio.** Juan Embil Bollada. *Revista Farmaceutica de Cuba*, v. 35, May 1957, p. 239-242.

Corrosion of piping and other iron items was due to action of vibrio-type bacteria and occurred in two forms: as a result of action of hydrosulphuric acid, and anaerobic corrosion, the latter being more serious. Electrochemical protection of iron elements in contact with waters avails little against anaerobic corrosion. Solution is to use glass or plastic in place of iron. (R1g; Fe)

416-R. Effect of Oxide Recrystallization on the Oxidation Kinetics of a 62:38 Copper-Nickel Alloy. J. A. Sartell, S. Bendel, T. L. Johnston and C. H. Li. *American Society for Metals, Transactions*, v. 50, Preprint no. 47, 1957, 24 p.

During isothermal oxidation, two oxide layers are formed; an outer cubic oxide layer whose growth is described by a single parabolic law and an inner layer, consisting of a mixture of cuprous oxide and nickel monoxide, whose growth is described by two consecutive parabolic laws. 12 ref. (R1h, Cu, Ni)

417-R. Influence of Nickel on Intergranular Corrosion of 18% Chromium Steels. J. R. Upp, F. H. Beck and M. G. Fontana. *American Society for Metals, Transactions*, v. 50, Preprint no. 51, 1957, 18 p.

Alloys containing intermediate nickel compositions were cast, rolled, heat treated and tested to determine the influence of this element on corrosion behavior. It was found that the transition occurs at about 2.5 to 3% nickel. Steels with higher nickel should be heat treated like the austenitic steels and those below like the ferritic steels. An unexpected result was the good resistance to intergranular corrosion of all of these alloys when water quenched from 1400° F. 8 ref.
(R2h, 2-10; SS, Cr, Ni)

418-R. Corrosion Resistance of Titanium to Sea Water. J. B. Cotton and B. P. Downing. *Institute of Marine Engineers, Transactions*, v. 69, Aug. 1957, p. 311-319. (CMA)

The protective role of titanium surface films was demonstrated with electrode potential measurements.

Resistance is high to flowing steam and to flowing seawater transporting abrasive matter. Crevice attack of titanium is insignificant. Galvanic behavior of titanium coupled with numerous other metals is reported. 20 ref. (R4b; Ti)

419-R. (Czech.) **Oxidation of Steels in Superheated Steam.** Pavel Gröbner and Zdenek Bret. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 125-131.

Experiments demonstrate that it is possible to apply Wagner theory on iron and steel oxidation in superheated steam with sufficient exactness for practical purposes. 23 ref. (R4d, R2h; ST)

420-R. (French.) **Contribution to the Study of Corrosion of Aluminum in an Alkaline Medium.** Helmy Makram. *Comptes Rendus,* v. 244, June 24, 1957, p. 3153-3154.

Some 99.8% pure copper plates covered with 0.05 mm. thick film of 99.5% pure aluminum were immersed in solution of sodium hydroxide. Measure of corrosive power of solution in function of time permitted determination of instant at which equilibrium was established between base metal and electrolyte. (R6j; Al)

Inspection and Control

474-S. Ultrasonics in the Foundry. J. Jarvis. *British Foundryman,* v. 50, Aug. 1957, p. 400-406.

Testing methods and experience in testing for and diagnosing variety of gray iron casting defects such as porosity, blowholes, shrinkage and inclusions with ultrasonic equipment. (S13g; CI, 9-17, 9-18, 9-19)

475-S. Measurament of Casting Surface Roughness. C. H. Good and C. E. McQuiston. *Foundry,* v. 85, Oct. 1957, p. 116-120.

Importance of surface finish; methods of measuring surface roughness; evaluation and criteria to be considered in selection of appropriate method; Stylus tracer method. 6 ref. (S15; 5)

476-S. An Apparatus for Determining Hydrogen Content of Titanium and Its Alloys. E. G. Fatzer. *Industrial Laboratories,* v. 8, Sept. 1957, p. 22-33. (CMA)

Equipment for determining the hydrogen content of titanium, characterized as the "warm extraction" type. Hydrogen is removed in a high vacuum and transferred to a known volume; the developed pressure is measured by a McLeod gage. The research beind the apparatus and method are discusssed, with emphasis on the Ti-H equilibrium system. 13 ref. (S11r, 1-3; Ti, *H*)

477-S. International Standard for Wrought Light Alloys. Pt. 9. Summary and Conclusions. *Light Metals,* v. 20, Aug. 1957, p. 250-252.

Tabular data giving designation or specification used for different chemical composition of wrought aluminum alloys by British, United States, Canadian, French, German, Swiss and Italian users. (S22; Al)

478-S. Development of Non-Destructive Tests for Structural Adhesive Bonds. Pt. 5. J. S. Arnold, Stanford Research Institute. (Wright Air Development Center), *U. S. Office of Technical Services,* PB 131046, 62 p. $1.75.

Tests of the ultrasonic Stub-meter performed by airframe manufacturing laboratories. Laboratory work was performed on improving the means of choosing optimum frequency ranges, probes for curved surfaces and for standard lap shear specimens, electrodes with improved wear resistance, visualization of vibration modes, effects of loading, and improved circuitry. (S13g, 7-8, 1-3, NM-d34)

479-S. Maintaining Workmanship Standards for Quality Welding. Howard B. Cary. *Welding Journal,* v. 36, Aug. 1957, p. 773-778.

Specifications and setup precautions taken to maintain quality in weld made in mild, medium and alloy steel, at Power Shovel Co. (S22, K general; ST)

480-S. Method of Measuring Wear in Wire Drawing Dies. Garth M. McLeod and William R. Moyers. *Western Electric Engineer,* v. 1, July 1957, p. 12-14.

A standard inspection system is described and other test methods compared. (S general, Q9n, 1-4, W24n, F28)

481-S. (French.) **Applications of Vacuum to Analysis of Gases in Metals.** M. Hanin. *Vide,* v. 12, Mar-Apr. 1957, p. 148-161.

Applications to steelmaking; decription of a vacuum reducing apparatus and automatic general service Toepler pump used with it; possibilities of vacuum methods for metals other than steel. 15 ref. (S11, 1-23; ST)

482-S. (German.) **Further Developments in the Determination of Phosphorus, Tungsten, Silicon-Nickel and Boron Contents of Steel Through Colorimetric Methods.** Erich Piper and Heinz Hagedorn. *Archiv für das Eisenhüttenwesen,* v. 28, July 1957, p. 373-377.

Accuracy, simplicity and economy compare favorably with spectrometers. Detailed specifications for preparation of specimens and improved working procedures are given qualitatively and quantitatively. (S11a; ST, *P, W, Si, Ni, B*)

483-S. (German.) **Influence of Particle Size of Silicate Inclusions on the Photometric Determination of Silicon in Steel.** Wilhelm Anton Fischer and Manfred Wahlster. *Archiv für Eisenhüttenwesen,* v. 28, July 1957, p. 379-382.

Specimens contained primary silicates formed immediately after the addition of silicon and secondary silicates formed during the cooling and solidification process. The primary silicate inclusions often have a diameter of 10 to 15 microns while the secondary silicates are 2 to 4 microns. Photometric determination is possible only when the size of silicate particles does not exceed 6 microns, and is not feasible where primary silicates are anticipated. (S11a; ST, *Si*)

484-S. (German.) **Quick Photometric Method for the Determination of Titanium in Copper Alloys.** Hugo Weidmann. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 410-412.

Under favorable conditions of solubility titanium in aluminum and steel alloys may also be determined; the required time for analysis is claimed to be less than 15 min. (S11a; Cu, *Ti*)

485-S. (Italian.) **Systematic Analysis of Aluminum Alloys by Means of Chromatography.** Giovanni Venturello and Anna Maria Ghe. *Annali di Chimica,* v. 47, July-Aug. 1957, p. 912-918.

Method developed for qualitative determination of principal elements present in aluminum alloys, particularly Mn, Mg, Cu, Fe, Zn, Ni and Cr, permits detection of elements present in quantities of 0.1-0.2%. Method can be extended to quantitative analysis of these alloys. (S11a; Al)

486-S. (Italian.) **The Use of Ultrasonics in Non-Destructive Testing.** Luigi Scuri. *Calore,* v. 28, May 1957, p. 197-202.

Techniques, fields of use, practical advantages, limitations of ultrasonic testing. (S13g)

487-S. (Italian.) **Liquid Flaw Detectors.** Giuseppe Finocchiaro. *Macchine,* v. 12, Aug. 1957, p. 787-799.

Magnetic particle and optical fluorescence techniques reviewed. (S13j, S13d)

488-S. (Japanese.) **Analysis of Aluminum by Gamma Rays.** Tunesabro Asada. *Metals,* v. 27, Aug. 1957, p. 638-640.

Nuclear reactors for radiography; table of photonuclear reactions; analysis of oxygen in aluminum by radiography. (S11q, 1-3; Al, *O*)

489-S. (Roumanian.) **Quantitative Determination of Lead in Tin-Base Alloys Used in Canning Industry.** N. Bruja. *Revista de Chimie,* v. 7, 1956, p. 546-550.

Removal of lead from container materials; polarographic method of metering lead to tin products; shortened analysis time for determining lead content. (S11m; Sn, *Pb*)

490-S. (Russian.) **Test for Fine Cracks in Billets and Finished Products.** Z. M. Kalinina. *Stal',* v. 17, Mar. 1957, p. 261-263.

Comparison of tests for fine cracks in billets; results of tests on step-shaped samples and of non-destructive tests on finished billets showed no correlation; discontinuance of tests of step-shaped samples recommended. (S13, 1-10; ST, 4-2, 9-22)

491-S. (Russian.) **Statistical Method of Controlling Operations in Tube Production.** I. M. Ludenskii, *Stal',* v. 17, June 1957, p. 543-547.

Method was developed as a result of an investigation of study of relation between different tube wall thickness and the average tube wall thickness. Results are given in mathematical tables and charts, and claim is made that deviations in the process are checked in time so as to improve rolling practice. (S12g, F26s)

492-S. (Spanish.) **New Colorimetric Method for Determining Phosphorus Content of Steels and Alloys.** F. Burriel Marti, V. Hernando Fernandez and J. Rodriguez Senas. *Real Sociedad Espanola de Fisica y Quimica, Anales, Serie B, Quimica,* v. 53 (B), May 1957, p. 361-368.

Method based on Burriel-Hernando method for assaying phosphorus content of soils. It was necessary to change both manner of processing sample and development of color in order to compensate for interference due to strong concentration of iron. It was not necessary, in the alloys studied, to make accessory blank tests for purpose of annulling interference of chromium or other elements. 11 ref. (S11a; ST, *P*)

493-S. Electrolytic Extraction of Carbides From Carbon Steel. R. W. Gurry, J. Christakos and C. D. Stricker. *American Society for Metals, Transactions,* v. 50, Preprint no. 4, 1957, 34 p.

Proposed method results in less decomposition of the carbide than other established methods. The performance of the new method upon steels tempered over a range of temperature is demonstrated.
(S11f; CN, 14-18)

494-S. Determination of Cerium in Bismuth-Base Alloys. J. W. Edwards and G. W. C. Milner. *Analyst,* v. 82, Aug. 1957, p. 593-594. (CMA)

A method for cerium in bismuth-base alloys was developed, based on direct titration with standard permanganate and photometric determination of the excess permanganate. Negligible interference comes from bismuth and uranium. 3 ref.
(S11j; Bi, *Ce*)

495-S. (Japanese.) **Studies on the Quantitative Analysis of Carbon in Titanium and Its Alloys.** Makaaki Oda and Katsusuke Norishima. *Electrochemical Society of Japan, Journal,* v. 25, June 1957, p. 319-322. (CMA)

The combustion method used for carbon in iron and steel was studied as to analytical conditions, apparatus and the influence of co-existing chlorine in order to apply it to titanium. A number of features in the system were improved. 11 ref.
(S11, Ti, *C*)

496-S. Portable Spectrometer for Identifying Metals. Louis E. Owen and Robert F. O'Connell. *Metal Progress,* v. 72, Sept. 1957, p. 94.

Instrument for identifying small samples in the laboratory, critical components of large assemblies in the field, and metal stock for fabrication of special equipment.
(S11k, 1-2)

497-S. Critical Survey of the General Limitations of the Nondestructive Testing Field. D. W. Ballard. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 198-207.

26 references. (S13, S general)

498-S. Ultrasonic Testing With Lamb Waves. D. C. Worlton. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 218-222.

Lamb waves have ability to travel in thin metal sections making possible the detection of defects so near the metal surface as to be difficult to detect by conventional ultrasonic methods; possibilities of using Lamb waves in testing shapes other than plates. 4 ref. (S13g)

499-S. Accelerated Life Tests. Harry G. Romig. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 224-228.

Problems in and need for life testing. 17 ref. (S21)

500-S. Advantages and Limits of Nondestructive Testing. H. Krainer. *Nondestructive Testing,* v. 15, July-Aug. 1957, p. 234-240.

Factors to consider when selecting nondestructive testing method for revealing defects and for checking physical or mechanical properties; magnetic, radiographic and ultrasonic methods. 5 ref. (S13)

501-S. Quality Predictions on Liquid Cast Iron and Steel, Based on Optical Temperature Measurements. K. Orths. *Archiv für das Eisenhüttenwesen,* v. 27, no. 5, 1956, p. 289-295. (*Henry Brutcher Translation* no. 3803.)

Previously abstracted from original. See item 399-S, 1956.
(S16, N12, CI)

502-S. (Czech.) **Polarographic Determination of Tin and Antimony in Iron and Steel.** Lubomir Brhacek. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 140-141.

Method may also be used for determination of tin and antimony in copper alloys. 15 ref.
(S11m; ST, Fe, *Sn, Sb*)

503-S. (Czech.) **Importance and the Influence of Electrolytes During the Isolation of Carbides From Steels.** Narcis Tietz, Vaclav Toman and Hanus Tuma. *Hutnicke Listy,* v. 12, no. 6, 1957, p. 517-521.

Investigates electrolytes from standpoint of quantitative isolation of carbides; examines iron, chromium and complex carbides isolated from steels and alloys and artificially prepared vanadium, molybdenum, tungsten, titanium, zirconium and chromium carbides with hydrochloric acid, citric acid and other materials as electrolytes. 14 ref.
(S11f; ST, *C*)

504-S. (Italian.) **Systematic Analysis of Aluminum Alloys by Means of Chromatography. Note 2. Quantitative Analysis.** Giovanni Venturello and Anna Maria Ghe. *Annali di Chimica,* v. 47, July-Aug. 1957, p. 919-928.

Measurement of quantities of 0.1 to 2% of Ni, Zn and Cr, to 3% of Mn and Mg, to even higher percentages of Fe and Cu. (S11a; Al)

505-S. (Slovene.) **Contribution to the Polarographic Determinations of Lead in Barite Ores and Their Flotation Products.** Sergej Gomiscek. *Rudarsko Metalurski Zbornik,* no. 2, Summer 1957, p. 135-141.

The polarographic method for determination of lead will give good results if the samples have previously been extracted with hydrochloric acid. It is an accurate, quick and simple method suitable for rapid determination of lead in barite ores and flotation products.
(S11m; Pb)

Metal Products and Parts

293-T. Aluminum Bronzes for Marine Applications. W. Lee Williams. *American Society of Naval Engineers, Journal,* v. 69, Aug. 1957, p. 453-461.

Physical, mechanical and corrosion properties of interest to designers of shipboard machinery components. (T22m, 17-7; Cu-s, *Al*)

294-T. Manufacture of Aircraft Engine Castings. C. W. Hicks. *British Foundryman,* v. 50, Aug. 1957, p. 408-418.

Molding, coremaking, pouring and inspection details in the manufacture of iron, aluminum and magnesium castings used in jet and gas turbine airplane engines.
(T24b, 17-7, E11; Al, Mg, Fe)

295-T. Cemented Tungsten Carbides, Their Applications and Problems. Frank A. Lytton. *Indian and Eastern Engineer,* v. 120, June 1957, p. 385-388.

The more practical aspects of the usage brazing and handling of cemented carbide tips. The cutting speeds and grinding procedure appropriate to the various grades of cemented carbide are detailed.
(T6n, 17-7; W, C, 6-19)

296-T. Aluminium in Electrical Engineering. *Light Metals,* v. 20, Aug. 1957, p. 255-257.

Abstracts of papers presented at Aluminum Development Association Symposium on application of aluminum conductors to electrical transmission and electrical equipment with reference to Italian, German, French and British experience.
(T1, 17-7; Al)

297-T. Pressure Die Casting Conference—Paris. *Light Metals,* v. 20, Aug. 1957, p. 268-269.

Abstracts of papers presented on potential for application of aluminum die castings in automobile industry. (T21, 17-7; Al, 5-11)

298-T. Production and Applications of Aluminium Powders and Pastes. *Metal Finishing Journal,* v. 3, Aug. 1957, p. 317-322.

Application of aluminum powders as pigment for coating; nature and properties of aluminum paint. (To be concluded.) (T29c, 17-7; Al, 6-18)

299-T. Aluminum in Ships. Carl W. Leveau. *Modern Metals,* v. 13, Aug. 1957, p. 42-47.

Reviews application of aluminum in ship construction and discusses structural design and advantages in use of aluminum. (T22, 17-7; Al)

300-T. (Japanese.) **Recent Development in Atomic Fuels in United States of America.** Hashida and Taketani. *Metals,* v. 27, Aug. 1957, p. 652-656.

Uranium alloys as atomic fuels; temperature ranges of atomic fuel for the industrial use; comparison of different atomic fuels.
(T11g, 17-7; U)

301-T. Industrial Applications of Titanium. G. T. Fraser, W. L. Findlay and A. G. Caterson. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 75A-76A. (CMA)

Du Pont uses titanium for thermowells in nitric acid environments, Wyandotte Chemicals uses it for an impeller with organic chlorides, and PennSalt uses it for a filterpress in a hypochlorite slurry. Du Pont's pigments department uses titanium steam jet diffusers which are subject to steam and HCl corrosion.
(T29, 17-7; Ti)

302-T. Applications of Light Metals. Pt. 27. *Light Metals,* v. 20, Sept. 1957, p. 294-295.

Bibliography of articles on use of aluminum in railroads and note describing applications on French trains. 18 ref. (T23, 17-7; Al)

303-T. Substituting Aluminium for Grey Iron in Multi-Cylinder Engine Blocks. *Light Metals,* v. 20, Sept. 1957, p. 303-305.

Problems and their alleviation in substituting aluminum for gray iron in engine block castings.
(T21b, 17-7; Al)

304-T. (French.) **Manufacture of the Renault Dauphine. C. P.** *Machine Moderne,* v. 51, Sept. 1957, p. 25-33.

Application of automation and scientific management at Renault; operations on engine-blocks and crankshaft bearings. (T21b, 17-7)

305-T. Resistance Wire Improved by Vacuum Melting. Charles G. Gilbart. *Metal Progress,* v. 72, Sept. 1957, p. 93-94.

Vacuum melted nickel-chromium alloy is cast in chill copper molds

and drawn in a conventional manner to produce inclusion free wire with reduced coefficient of resistance. (T1p, 17-7, C25; Ni, Cr)

W Plant Equipment

410-W. Development of Controlled Air Distribution Furnace. J. M. Stapleton. *Blast Furnace and Steel Plant,* v. 45, Sept. 1957, p. 1007-1017.

Dry blast and wet blast; tuyere design; lining performance; measurement of air flow to the tuyeres by taking piston tube traverse readings of blow stock; computation of actual velocities and volume of blast; design and function of an air proportioning system. (W17g, 1-2)

411-W. Simple, Low Cost Methods for Controlling Weld Faults. J. E. Sangster. *Canadian Metalworking,* v. 20, Aug. 1957, p. 48-52.

Precautions in electrode selection, pre-treatment, fitup and inspection during and after welding for reducing weld defects. (W29h, 1-2, S general)

412-W. High-Frequency Melting for Research. *Electrical Times,* v. 132, Aug. 15, 1957, p. 229-230.

Installation consists of 200-kw. motor generator and ancillary equipment and four conventional furnaces. Schematic arrangement of main circuits of furnace installation. (W18a, 1-2)

413-W. UK's Largest Roll Housing. *Foundry Trade Journal,* v. 103, Aug. 29, 1957, p. 259-261.

Heaviest rolling-mill housing to be made in Great Britian was recently cast by English Steel Castings Corp., Ltd. Housing took 700 hr. to mold, some 250 tons of liquid steel being poured in 26 min. Casting took three weeks to cool before stripping, with a further 800 hr. devoted to fettling and cleaning. (W23m, 17-7, E-11; ST)

414-W. Knock-Out Ventilation in the Foundry. W. D. Bamford, F. R. Wilson and J. Bright. *Institution of Heating and Ventilating Engineers, Journal,* v. 25, Aug. 1957, p. 113-125.

Design of a side-draught ventilating system for a foundry knockout unit, and the steps taken to coordinate the movement of molds and castings with the requirements of this ventilating system. (W10d, E general)

415-W. Hydraulic Equipment in Steelworks. Pt. 3. Application and Experience in a Cold-Rolling Mill. F. E. C. Probyn. *Iron and Coal Trades Review,* v. 175, Aug. 9, 1957, p. 307-313.

Problems with leakage, valves, hose connections, and pumps; modern trends in application of hydraulic equipment. (W10, W13, W23, 1-2, 1-20)

416-W. Design of Die-Castings. Pt. II. The Influence of the Rigid Die. H. K. Barton. *Metal Industry,* v. 91, Aug. 16, 1957, p. 125-127.

Gives normal drafts and papers for cores and diecasting wall for die casting tin, lead, zinc, aluminum, magnesium or copper alloys; movable cores, separate sliding block and other devices to meet requirements for casting different shapes. (To be concluded.) (W19n, 1-2, 17-1)

417-W. Design of Die-Castings. Pt. II. The Influence of the Rigid Die. H. K. Barton. *Metal Industry,* v. 91, Aug. 23, 1957, p. 151-152.

Discusses moving core and die parts, in die casting die closure and effect of die design on dimensional tolerances. (W19n, 1-2, 17-1)

418-W. Special Steels for Turbine Generators. Charles Sykes. *Metal Progress,* v. 72, Sept. 1957, p. 200, 206-207, 210. (Digest from "The Special Steelmaker and Power Generation", Fifth Harold Wright Lecture, Cleveland Scientific and Technical Institution, Middlesbrough, England, Nov. 29, 1956, 35 p.)

Summary of the alloy steels used by the English turbine-generator builders coupled with a good description of some of the metallurgical problems that arise in producing these special steels. (W11q, 17-7; AY)

419-W. Development of the Hydrocyclone. Stephen E. Erickson. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 869-872.

Size, shape and details of cyclones from early dust collector types to current designs for desliming, classification or thickening of minerals. (W15p, 1-2)

420-W. Selecting a Cyclone for Wet Classification. E. C. Herkenhoff. Paper from "Symposium on Cyclones." *Mining Engineering,* v. 9, Aug. 1957, p. 873-876.

Factors to consider include tonnage rate to be treated, open or closed circuit, overflow or underflow of value, subsequent treatment, mesh of separation desired; limitations of dilution, specific gravity, composition, shape and size range of feed particles, nature of suspension liquid, variations in feed volume, control desired and pulp temperature. (W15p, B13c, 1-2)

421-W. Metallizing Ovens Require Process Know-How. Herman G. Gehrich. *New York Industrial World,* v. 2, Aug. 1957, p. 12-14.

Production flexibility was a basic consideration in the design of these gas-fired ovens that may be called on to process plastic, metal or glass during the same day. (W4k, L23, 1-2)

422-W. Tool Steels. Pt. 4. Selection of Materials for Hot Work Applications. L. F. Spencer. *Steel Processing and Conversion,* v. 43, Aug. 1957, p. 447-455, 469, 472.

Chemical composition, hardness, microstructure, special properties and heat treating conditions for a variety of toolsteels useful in hot work applications; includes steel for die casting dies, hot forging dies, dies for hot extrusion and accessory equipment applications. 10 ref. (W19n, W22a, W24n, 17-7; TS)

423-W. The Best Power Source for Automatic Wire Feed? L. P. Henderson. *Welding Engineer,* v. 42, Sept. 1957, p. 34-35.

Relative advantages of constant current, variable voltage-variable current and constant voltage control system and characteristics and advantages of each, for control of wire feed in automatic arc welding. (W29a, K1, 1-2)

424-W. Electrode Control in an Alloy Pressure-Vessel Plant. W. W. Weber. *Welding Journal,* v. 36, Aug. 1957, p. 798-801.

Handling regulations and control of electrodes to insure quality welds. (W29h, 1-2)

425-W. (German.) **Modern Cupola Practice.** H. Anders. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p. 319-322.

Importance of the use of the right type of furnace in foundries; design and operation of some modern equipment. (W18d, 1-2)

426-W. (German.) **Are Hot Blast Cupola Furnaces in Iron Foundries Economical?** Hans Reininger. *Giesserei-Praxis,* v. 75, Aug. 10, 1957, p.327-334.

Description of hot blast cupola furnace design, operation and development; comparison with cold blast furnace shows the hot blast superior technically, metallurgically and economically; data in tabular form are given for both types on 11 important cost characteristics. (W18d, 1-2; CI)

427-W. (German.) **Multiple-Roll Cold Rolling Stands.** Georg Thiel. *Zeitschrift für Metallkunde,* v. 48, July 1957, p. 399-403.

The development of cold rolling stands as designed by W. Rohn and the design features of modern equipment. Possible applications and practical results. Advantages over common rolling stands used up to present time. (W23f, 1-2)

428-W. (Japanese.) **The Welding Rod and Its Selection.** Ko Nakayama. *Metals,* v. 27, Aug. 1957, p. 603-607.

Characteristics of the iron powder type welding rod, its efficiency and mechanical properties. (W29h, 17-7; Fe)

429-W. (Russian.) **Charging of Raw Materials Into the Blast Furnace Skips by Belt Conveyors.** N. S. Fill & I. S. Lemberikman. *Stal',* v. 17, June 1957, p. 493-495.

Plea for the replacement by belt conveyers of the scale-cars and subsequently, of the skip charging of raw materials. Testing of this new system of burden charging is particularly essential in connection with the forthcoming construction of super-high capacity blast furnaces. (W12r, DI, 1-2)

430-W. New Nodular Cast Iron Welding Rod for Foundries and Fabricators. R. O. Day, J. S. Snyder and H. V. Inskeep. *Welding Journal,* v. 36, Sept. 1957, p. 410s-414s.

Use of a nodular iron as a filler metal yields a fully nodular deposit with reasonable ductility using oxy-acetylene welding method. Deposits made with this rod by means of the gas-shielded tungsten-arc method are also nodular and of good quality. (W29h, 1-2, 17-7; CI-r)

431-W. (Czech.) **Dynamics of Feeding Devices for Pilger Rolls.** Antonin Cermak. *Hutnicke Listy,* v. 12, no. 2, 1957, p. 116-125.

A graphical investigation of dynamics of feeding in the rolling of tubes on pilger rolls; importance of curves of dynamic and kinematic factors in instant of meshing puddle bars with rolls when feeding action is changed into reciprocating motion caused by rolling; curves of track speed and time. (W23h, 1-2)

432-W. (French.) **Ultrasonics. Industrial Applications. Pt. 2.** P. Hemardinquer. *Pratique des Industries Mecaniques,* v. 43, July 1957, p. 177-182.

Applications to welding and galvanizing of light alloys; ultrasonic soldering irons; foundry applications. (W general, 1-24)

433-W. (French.) **Duplex Furnace for Electrolytic Refining of Aluminum.** Louis Ferrand. *Revue Generale de l'Electriciate,* v. 66, July 1957, p. 361-373.

Two operations are carried out simultaneously in a single furnace;

primary electrolysis provides raw material which serves as liquid cathode in center crucible; electrolytic refining of raw metal takes place in lateral crucibles. Design of channels connecting crucibles includes cooled segregation chamber which permits separation by crystallization of impurities from bottom layer of metal. 44 ref.
(W18e, 1-2; Al)

434-W. (Spanish.) **The Electrode and Its Coating.** *Fusion de Metales,* v. 19, July-Aug. 1957, p. 15-18.

Types, function, composition of coatings; explanation of electrode code designations. (W29h, 1-2)

435-W. The Hot Strip Mill at Hagfors. W. Bengtson. *ASEA Journal,* v. 30, 1957, p. 51-64.

Semicontinuous hot strip mill for strip gages up to about 440 mm., operating at close tolerances and reduced manpower. 2 ref.
(W23c, 1-16; ST)

436-W. Progress at Ravenscraig. *Iron and Coal Trades Review,* v. 175, Aug. 16, 1957, p. 365-372.

Ravenscraig steelworks of Colville group includes 70 Becker type combination gas guncoke ovens, sulphate of ammonia plant, benzole plant, 1000 tons per day all welded blast furnace, ancillary equipment, power station and melting shop.
(W10, 1-2; ST, Fe)

437-W. Add Life, Cut Cares, Use Carbon Refractories in Cupola Construction. G. B. Tatum. *Modern Castings,* v. 32, Oct. 1957, p. 58-64.

Carbon blocks used for lining cupola wells, tapholes and slagging troughs resist attack from acid and basic slags and have high strength at elevated temperatures.
(W18d, 1-2; RM-h39)

X Instrumentation

Laboratory and Control Equipment

92-X. (French.) **Determination of Charge Level of Automatically Charged Cupolas.** *Journal d'Informations Techniques des Industries de la Fonderie,* no. 88, July 1957, p. 9-10.

Description of mirror, manometer and electrical reading devices.
(X13, W18d, 1-2)

93-X. (French.) **Vacuum Ovens for Metallurgical Research.** M. T. Destribats. *Vide,* v. 12, Mar-Apr. 1957, p. 184-187.

Construction of vacuum ovens for lab work from ordinary commercial elements; operation. Ovens were used for heat treatment, solid state diffusion; could also be used as soaking pits. (X24f, 1-23)

94-X. (German.) **Determination of Hysteresis Losses of Silicon Sheets with a Device Measuring Complete Sheets.** Gerhard Wollweber. *Archiv für das Eisenhuttenwesen,* v. 28, July 1957, p. 397-399.

A new measuring device for hysteresis losses of complete sheets permits repeated indication of flux density with ± 5% and of hysteresis losses with ±1%. These values differ from those obtained in the Epstein-Rahmen from 3% to 5%. Thus the new device is suitable for sorting of sheets to close limits of hysteresis losses.
(X26, 1-2; Fe, *Si,* SGA-n)

95-X. (Russian.) **Dependence Temperature on Specific Heat in the Aluminothermic Welding Process.** V. A. Bogolubov. *Stal',* v. 17, June 1957, p. 531-535.

Theoretical considerations, description of a calorimetric testing apparatus using tungsten-molybdenum thermocouple to corroborate the theoretical results. A practical application is the speeding up of the calculation of temperature in the aluminothermic process. Schematic and sectional drawings of the calorimeter. 6 ref. (X24e, 1-3, P12r, K1)

96-X. Apparatus for Determining the Hardness of Metals at Temperatures up to 3000° F. Elevated Temperature Hardness of Iron, Molybdenum, Tungsten and S-816. M. Semchyshen and C. S. Torgerson. *American Society for Metals, Transactions,* v. 50, Preprint no. 12, 1957, 9 p.

The principles of the pyramid penetration method of hardness testing have been embodied in the apparatus by the use of synthetic sapphire for the penetrator. The hardness determinations are carried out in a purified argon atmosphere which protects the test specimen and heating element from oxidation.
(Q29p, 1-3, 1-4; Fe-a, Mo, W, SS)

97-X. A New Static Control System. Frank C. Fennell. *Iron and Steel Engineer,* v. 34, Aug. 1957, p. 125-132.

Magnetic amplifier acting as static-type switching system finds application in blast furnace charging equipment control, ore sintering plant feed control and reversing mill operations.
(X13, D1, B16a, F23, 1-2; ST)

98-X. Apparatus for Determination of Hydrogen in Steel. L. Bjerkerud. *Jernkontorets Annaler,* v. 141, no. 2, 1957, p. 90-94. (*Henry Brutcher Translation* no. 4027.)

Previously abstracted from original. See item 49-X, 1957.
(X21, 12, S11; ST, H)

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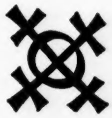

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Betty A. Bryan, Editor

Sworn to and subscribed before me this 8th day of Oct., 1957. (Seal) Charlotte Finley, Notary Public. (My commission expires May 20, 1960.)